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PESTICIDES ABSTRACTS (formerly Health Aspects of Pesticides Abstract Bulletin) is a monthly publication of the Technical Services Division of the Office of Pesticide Programs, Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides as defined in the Table of Contents. The publication represents a monthly review of more than 2,000 primary and secondary sources. A list of periodicals from which articles have been abstracted appears annually in the January issue. Subjects and authors of abstracted articles are cross-referenced in quarterly and annual indexes. Reprint requests should be directed to the author of the complete article.

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ERRATUM

Page numbers 115-120 in the February, 1975, issue of *Pesticides Abstracts* were inadvertently repeated in the March, 1975 issue.

75-0753. Anonymous. **A dangerous precedent.** *Farm Chem. 137(11): 30,32-33; 1974.*

EPA Administrator R. E. Train has announced that any chemical which increases the incidence of benign or malignant tumors in man or animal must be considered carcinogenic and that the concept of a threshold level of carcinogenic effect has no practical significance. Train disputes the claims of eminent scientists that mice are not appropriate test animals because of high incidences of spontaneous tumors, noting the general biological similarity between mice and other mammals including man. Shell Chemical Co., manufacturer of aldrin and dieldrin, has charged violation of its due process of law in that, during the suspension hearing for aldrin and dieldrin, Shell had less time than EPA to present its case. Further, when notice of the suspension of manufacture of aldrin and dieldrin was issued by EPA, none of Shell's medical testimony had been served. Testimony that alternatives to aldrin and dieldrin will not be available in sufficient quantities in 1975 and that large crop losses will result was dismissed. Although Train argues that the suspension decision will not affect his decision, the cancellation hearing will be held in abeyance for an undetermined period. Meanwhile, although the further manufacture of aldrin and dieldrin is prohibited, any chemical already produced will be permitted to be used, despite EPA's claim that the pesticides pose an imminent hazard to the public. The principles of carcinogenicity testing adopted by EPA are being challenged.

75-0754. Weller, T. H. (Harvard Sch. Public Health, Boston, MA 02115). **World health in a changing world.** *J. Trop. Med. Hyg. 77(4): 54-61; 1974.* (19 references)

Residual insecticides were heavily used to oppose infectious agents which cause diseases such as malaria in man. Mistakes were made along the way. Eradication by residual insecticides was embraced over-enthusiastically. The complex epidemiology of malaria was not completely understood and what information was available was largely dismissed as no longer necessary. The continual emergence of new problems was not anticipated. New scientists were not trained in the classical malariologic sense, nor was an adequate program of basic research in malaria maintained. The fact that individual successes would be transient if not in phase with other health programs and with levels of social and economic development was not considered. In this respect, particular attention is given to population control in underdeveloped countries.

75-0755. Gysin, H. (CIBA-Geigy Ltd., Basel, Switzerland). **The possible impact of pesticides on the human environment.** *Phytoparasitica 1(1): 63; 1973.*

The decision whether pesticides or fertilizers should or should not be applied must be based on scientific facts; treatment with chemicals is justified only when the benefits outweigh any possible negative effects. Since all biologically active compounds and/or their metabolites may have some toxicological effects on man, long-term chronic toxicity tests must be undertaken before any such compound is used under practical conditions. It is also imperative that farmers be well informed regarding the advantages and limitations of the materials they apply. Modern analytical methods allow the detection of pesticides in minute concentrations which, although far below hazardous levels, have erroneously caused concern among the general public. In the course of development of any new chemical, it is extremely important to study the possible impact of the original chemical as well as its degradation products on the environment.

75-0756. Goodman, G. T. (Dept. Appl. Biol., Chelsea Coll., Univ. London, London, England). **How do chemical substances affect the environment?** *Proc. R. Soc. London 185(B): 127-148; 1974.* (31 references)

The release of naturally occurring or man made chemical substances into the environment can have unplanned dangerous effects. A good deal is known about the effects of chemicals on man during production, transport, and use. Much less is known about the effects of such chemicals on wildlife species following the dispersal of the chemical in the environment. Ecological cycles and food chains may deliver hazardous chemicals from affected wildlife back to man. Wildlife can be useful as indicators of environmental states and trends for a potentially harmful substance, serving as an early warning system of future risks to man. Failure to recognize the mutually interactive roles of man, resource-species, wildlife organisms, and climate in the biosphere and their different tolerances to chemical substances has hindered the development of a unitary environmental management policy embracing all 4 biosphere components. Persistence is perhaps the most important criterion for predicting potential environmental harm by a pesticide. More information is needed on the influence of molecular structure on environmental persistence. The study of chemical effects in the environment involves a study of the levels of a substance accumulating in air, water, soils, and biota, as well a knowledge of when the threshold action-level has been reached. Studies of long-term continuous exposure to minute amounts of pesticides are becoming increasingly important. The difficult and necessarily long task of finding the causal agent when a genuine adverse effect is noted in the environment results in both over and underreaction, both based on scientific evidence.

75-0757. Fukuto, T. R. (Dept. Entomol., Univ. California, Riverside, CA 92502). **New aspects of organophosphorus pesticides. I. Introduction.** *Residue Rev. 53: 1-2; 1974.*

The present volume of *Residue Reviews* contains

seven articles from a symposium on new aspects of organophosphorus pesticides presented at the 165th National Meeting of the American Chemical Society (Pesticide Division) at Dallas, Texas, April 1973. An attempt was made to provide expertise in as many facets of organophosphorus pesticides as possible, with emphasis on recent advances. Individual papers are abstracted in the Toxicology and Pharmacology section of *Pesticides Abstracts*, with primary emphasis on the reported toxicity of the new compounds described to nontarget organisms.

75-0758. Shotwell, T. K. (One Metro Square, Villa Creek Dr., Dallas, TX). **Patterns in federal regulation of pesticides.** *Soap Cosmet. Chem. Spec. 50(12): 56,58,86,89; 1974.*

Federal regulation of pesticides is currently subject to rapidly escalating research and development costs, increasing unpredictability, scientific turmoil, and expanding regulatory processes. Consumer awareness has increased, but consumer knowledge has not kept pace, and political interests are of overwhelming significance. Pesticide regulation is performed on the basis of toxicology and ecology findings which are not always correctly interpreted. Consumerist and environmental political pressure groups may force regulatory officials to leap from inadequate facts to negative conclusions. The manager of a firm's research must bear these factors in mind and prepare his case for getting a chemical on the market so as to survive the pervading regulatory pattern. The increasing impact of these regulatory patterns is being noted in the decreasing amount of time going into the production and testing of new agricultural chemicals.

75-0759. Tafuri, F.; Businelli, M.; Scarponi, L.; Marucchini, C. (Istituto di Chimica Agraria, Univ. di Perugia, Perugia, Italy). **Residui lasciati nella lattuga e nel granturco dai trattamenti al terreno con clordano AG. [Residues on lettuce and corn after treatment of soil with chlordane AG.]** *Agrochimica 18(1-2): 102-109; 1973.* (13 references) (Italian)

A method for the determination of alpha- and gamma-chlordane residues, and for chlordane residue analyses in lettuce and corn following soil treatment with chlordane AG are described. Following extraction with *n*-hexane and isopropanol from soil, and with acetonitrile and pentane from plant materials, alpha- and gamma-chlordane are determined by gas chromatographic method with electron-capture detector. The rates of recovery from soil and crops were determined to be 88-93% and 73-88%, respectively. The sensitivity of the method is 0.001 ppm either for alpha- or gamma-chlordane. Soils treated with 3 or 6 kg/ha chlordane before planting and sowing contained 1.3 and 4.5 ppm alpha-chlordane, and 0.38 and 1.20 ppm gamma-chlordane at harvesting time. The residues found in edible parts of lettuce and corn were within safe limits (0.015-0.019 ppm alpha-chlordane and 0.002 ppm gamma-chlordane in corn, as well as 0.001-0.008 ppm alpha-chlordane and 0.001-0.006 ppm gamma-chlordane in corn).

75-0760. Luquet, F.; Goursaud, J. G.; Casalis, J. (Lab. Ind. Laitiere, E.N.S.I.A., Douai, France). **Les residus de pesticides organochlores dans les laits animaux et humains. [Organochlorine pesticide residues in animal and human milk.]** *Ann. Fals. Expert. Chim. 67(716): 217-239; 1974.* (2 references) (French)

Results of organochlorine pesticide residue analyses of dairy products and human milk conducted from 1967 to 1974 in France are presented. Butter samples investigated in the 1967-1968 period had alpha-BHC residues in excess of 0.20 mg/kg on fat basis at a frequency of 85%. In the 1971-1972 period, 35% of all samples contained more than 0.20 mg total BHC per kg. The overall residue level decreased from over 0.30 mg/kg in 1968 to or below 0.10 mg/kg in 1972. In cow milk, the reduction of the BHC levels is accompanied by a slight increase in the heptachlor epoxide and dieldrin levels. In ewe milk, a slight degree of pollution is due to BHC (averaging 0.12 mg/kg), heptachlor epoxide, and dieldrin. The average BHC level in goat milk was found to be 0.15 mg/kg. The contamination of the milk products is due to disinfection, treatment of the animals, and especially the contamination of forage. Human milk samples collected in the 1971-1972 period contained 2.75 mg total BHC, 0.28 mg heptachlor epoxide, 0.23 mg dieldrin, and 3.24 mg/kg DDT. The cumulation factors established relative to cow milk are 5-10 for BHC, 4-5 for heptachlor epoxide, 5-6 for dieldrin, and 50-100 for DDT.

75-0761. Baur, J. R.; Bovey, R. W. (Agr. Res. Serv., U.S. Dept. Agr., College Station, TX 77843). **Ultraviolet and volatility loss of herbicides.** *Arch. Environ. Contam. Toxicol. 2(3): 275-288; 1974.* (11 references)

Herbicide 2,4-D formulated as a urea-type polymer was readily destroyed by long-wave UV (356-nm) irradiation, whereas conventional 2,4-D was more resistant. The opposite relationship was noted for polymeric and conventional formulations of dicamba. Polymerized 2,4-D was more resistant to thermal degradation (60°C) than non-polymerized formulations. Ultraviolet degradation of polymerized 2,4-D was eliminated by the incorporation of RYLEX-H and UVINUL D-50, industrial UV absorbers. Exposure of polymeric dicamba to 60°C heat, followed by trapping of the volatile component, indicated that 21 percent was lost by thermal degradation and 46.6 percent by volatilization. Comparable values for non-polymerized dicamba were 37.9 and 60.1 percent. (Author abstract by permission)

75-0762. Burns, J. E.; Miller, F. M. (Inst. Environ. Med., New York Univ. Med. Cent., New York, NY 10016). **Hexachlorobenzene contamination: its effects in a Louisiana population.** *Arch. Environ. Health 30(1): 44-48; 1975.* (13 references)

Plasma hexachlorobenzene (HCB) residues in a Louisiana population exposed through the transportation and disposal of chemical waste containing HCB averaged 3.6 ± 4.3 ppb in a sample of 86 people. The highest level was 345 ppb in a waste disposal facility worker while the highest level in the general population was 23 ppb. There was no evidence of cutaneous porphyria by history or skin examination. Males had significantly higher residues than females (4.71 vs 2.79 ppb) but there were no age differences. A possible association between HCB residues and coproporphyrin and lactic dehydrogenase was found. Only 2 of 48 meals sampled were positive for HCB. There was a correlation between HCB levels in household dust and plasma levels. Perchloroethylene and carbon tetrachloride production workers had plasma HCB levels of up to 233 ppb. (Author abstract by permission)

75-0763. Zarkovic, G.; Custovic-Begovic, F.; Adamovic, V.; Bauer, K.; Jan, J. (Med. Fac., Univ. Sarajevo, Belgrade, Yugoslavia). **Contamination of foodstuffs and human fatty tissue by pesticide residues in Yugoslavia in 1969-1971.** *Arh. Hig. Rada Toksikol. 24: 381-391; 1973.* (26 references)

A survey of pesticide residues in 578 food products and 222 samples of human fatty tissue was performed in Yugoslavia during 1969-1971. Food of animal origin, primarily milk, was contaminated by organochlorine insecticides. DDT residues in milk ranged from 0.0035 to 0.0250 ppm. Animal fatty tissue used in nutrition was also contaminated by all organochlorine insecticides for which tests were made. Total DDT levels

varied considerably and in Skopje and Belgrade were 6-8 times higher than in Zagreb. The average value of total DDT in lard in Yugoslavia was 0.4041 ppm. In fruits and vegetables the values were within the tolerance limits. Organophosphorus insecticides were found in 19% of the fruit, vetetable, and oil samples tested and were below maximum tolerance. Arsenic was discovered in 52% of apple samples. Organochlorine insecticide residues were found in all samples of human fatty tissue. Differences by geographic territories were significant, while those by sex were not. Values by age displayed significant variations. It is noted that the 0-9 yr age grouping had a considerably higher average level of 8.01 ppm total DDT.

75-0764. Martens, P. H.; Nys, L.; Biston, R.; Fraselle, J. (Fac. Sci. Agron., Lab. Chim. Anal. Phytopharm., Gembloux, Belgium). **Propham, chlorpropham et pomme de terre (etude de residus). [Propham, chlorpropham, and potatoes. Residue study.]** *Bull. Rech. Agron. Gembloux 6(1-2): 127-141; 1971.* (23 references) (French)

The results of a previous study of IPC (propham) and CIPC (chlorpropham) residues in Brintje potatoes treated for sprout inhibition are summarized and interpreted. Of the four treatment methods, soaking, spraying, dusting, and aerosol, the latter seems least apt to contaminate potatoes while effectively inhibiting sprout formation. During lengthy storage the aerosol treatment may also be repeated. CIPC is more completely absorbed and more apt to contaminate below the skin of the potato than IPC. It also becomes more concentrated in the skin, given equal treatment conditions, and removal of the skin eliminates most of the danger since retention of both inhibitors in the potato flesh is below the recognized tolerance level of 0.5 ppm. Of home and industrial processing procedures, the cooking of potatoes in water is of most questionable value as a means of breaking down undesired residue. CIPC is more stable than IPC under water-cooking conditions, while the reverse is true when potatoes are fried in oil.

75-0765. Chisholm, D. (Res. Sta., Agr. Canada, Kentville, Nova Scotia, Canada). **Persistence of fensulfothion in soil and uptake by rutabagas and carrots.** *Can. J. Plant Sci. 54(4): 667-671; 1974.* (11 references)

Fensulfothion (Dasanit, *O,O*-diethyl *O*[*p*-(methylsulfinyl) phenyl] phosphorothioate) degraded rapidly in a sandy loam soil to a moderately persistent metabolite fensulfothion sulfone (*O,O*-diethyl *O*-[*p*-(methylsulfonyl) phenyl] phosphorothioate). Traces of fensulfothion sulfone were found in rutabagas (*Brassica napobrassica* Mill.) grown on fensulfothion-treated field plots, but were confined for the most part to the peel. The sulfone was detected in carrots at 0.10 ppm on a fresh weight basis. Fensulfothion sulfone persisted in frozen carrots (*Daucus carota* var. *sativa* DC.) during a storage period of 4 yr. A simplified gas-liquid chromatographic procedure for the determination of fensulfothion and some of its metabolic products is described. (Author abstract by permission)

75-0766. Ragab, M. T. H. (Res. Sta., Agr. Canada, Kentville, Nova Scotia, Canada). **Simazine persistence in soil and effects of its residue on crops.** *Can. J. Plant Sci. 54(4): 713-716; 1974.* (14 references)

When 4.48 kg/ha of simazine (2-chloro-4,6-bis(ethylamino)-*s*-triazine) was incorporated with soil to a depth of 15 cm; 53, 40, and 18% was detected at 18, 63, and 161 days, respectively, following which there was a gradual decrease to 1.5% at 690 days. When crops were grown the year after application and the soil contained 0.18 ppm simazine, no residue was detected in corn (*Zea mays* L.), oats (*Avena sativa* L.), or beans (*Phaseolus vulgaris* L.), but the latter two crops were injured and Swiss chard (*Beta vulgaris* var. *cicla* L.) did not grow. There was slight toxicity to oats planted 2 yr after application when the soil contained 0.03 ppm simazine. (Author abstract by permission)

75-0767. Arnold, J. S. (Univ. California, Riverside, CA 92507). **Some physical and chemical aspects of the adsorption of 4-amino-3,5,6-trichloropicolinic acid by soil and soil colloids.** *Diss. Abstr. Int. 35(6): 2540B; 1974.*

The adsorption of picloram by soils, soil colloids, and model adsorbents was studied with respect to the magnitude and strength of the adsorption process. The affinity for picloram as a function of cationic composition generally decreased in the order copper(II), iron(III), aluminum(III), zinc(II), and calcium(II). This is consistent with coordination theory. Picloram formed a stable chelate with copper(II). Picloram was adsorbed to a much greater extent at lower pH values. Maximum adsorption occurred between pH 3.0 and pH 4.0, with a minimum near neutrality. Picloram adsorption was only somewhat temperature-dependent, consistent with weak physical bonding mechanisms. The enthalpy of adsorption was on the order of 8 cal/mole-deg for non-coordinated types of adsorption. Adsorption isotherms obtained for 19 soils indicated that adsorption was best correlated with soil organic content. The relationship between adsorption and relative mobility of picloram using soil thin-layer chromatography was a negative linear correlation. Humic acid adsorbed more picloram/gram of adsorbent than did any other adsorbent studied. Thus picloram adsorption is largely a function of the organic matter content of soils, and picloram may be adsorbed from aqueous solution by either weak physical bonding or coordination reactions involving metallic cations on the exchange complex. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-28,838)

75-0768. Goering, D. K. (Univ. Arkansas, Fayetteville, AR 72701). **Organochlorine residues and eggshell characteristics in three species of Ciconiiform birds.** *Diss. Abstr. Int. 35(6): 3111B; 1974.*

Egg samples from two nesting populations each of white-faced glossy Ibis (*Plegadis chihi*), snowy egret (*Leucophoyx thula*), and cattle egret (*Bubulcus ibis*) were collected in southern Texas in 1970 and analyzed subsequently for organochlorine residues. Average levels of major residues from the two populations of white-faced glossy ibis were: dieldrin, 1.42 and 1.57; *p,p'*-DDE, 0.92 and 1.57; aroclor 1254, 0.59 and 0.04; lindane, .053 and .017. With canonical correlation analysis dieldrin was found to be positively correlated with shell thickness and negatively correlated with shell specific gravity in one population of ibis. DDE, aroclor 1254, and lindane had correlations with shell characteristics opposite to that of dieldrin. Residue levels were not correlated with eggshell characteristics in other populations even when residue levels were comparable. Snowy egret egg residue levels were similar to those in ibis but in order of abundance were: *p,p'*-DDE, aroclor 1254, and dieldrin. Cattle egret eggs had very low residue levels with *p,p'*-DDE constituting 96% of the load. No differences were found between 1970 and pre-1946 shell thickness. Distribution of residues in body tissue is similar to that in eggs. Residues in feces do not show relationship to egg or body residues. Organochlorine residues at the levels encountered in this study do not appear to be affecting shell characteristics sufficiently to be detrimental to reproduction in the three species studied. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 74-28,151)

75-0769. Chian, E. S. K.; Bruce, W. N.; Fang, H. H. P. (Environ. Eng., Civil Eng. Dept., Univ. Illinois, Urbana, IL 61801). **Removal of pesticides by reverse osmosis.** *Environ. Sci. Technol. 9(1): 52-59; 1975.* (24 references)

Two types of reverse osmosis membranes, i.e., cellulose acetate (CA) and cross-linked polyethylenimine, designated as NS-100 by OSW, were evaluated for their removal of a wide variety of pesticides, including chlorinated hydrocarbons, organophosphorus, and miscellaneous pesticides. With each membrane the rejection of pesticides was better than 99%. A considerable amount of pesticide was adsorbed onto the membrane materials. The extent of adsorption is governed by the van der Waals–London forces and hydrophobic bonding between pesticide molecules and the polymeric membrane materials. Membrane rejection of the pesticides is in turn governed by the polarity of the solute molecules in aqueous solution, which is in accord with the theory advanced by Sourirajan. (Author abstract reprinted by permission of the American Chemical Society)

75-0770. Mussman, H. C. (Meat and Poultry Insp. Program, Animal and Plant Health Insp. Serv., U.S. Dept. Agr., Washington, DC 20250). **Drug and chemical residues in domestic animals.** *Fed. Proc. Fed. Amer. Soc. Exp. Biol. 34(2): 197-201; 1975.*

A system is needed to monitor the large number of chemical substances that may find their way into the food supply. The U.S. Department of Agriculture's Meat and Poultry Inspection Program routinely tests for chemical residues in animals coming to slaughter. Pesticides, heavy metals, growth promotants (hormones and hormonelike agents), and antibiotics are included. Samples are taken statistically so that inferences as to national incidence of residues can be drawn. When a problem is identified, a more selective sampling is designed to help follow up on the initial regulatory action. In testing for pesticides, only DDT and dieldrin are found with any frequency and their levels are decreasing; violative residues of any chlorinated hydrocarbon are generally a result of an industrial accident rather than agricultural usage. Analyses for heavy metals have revealed detectable levels of mercury, lead, and others, but none at levels that are considered a health hazard. Of the hormone or hormonelike substances, only diethylstilbestrol has been a residue problem and its future is uncertain. The most extensive monitoring for veterinary drugs is on the antimicrobials, including sulfonamides, streptomycin, and the tetracycline group of antibiotics that constitute the bulk of the violations; their simultaneous use prophylactically and therapeutically has contributed to the problem in certain cases. A strong, well-designed user education program on proper application of pesticides, chemicals, and veterinary drugs appears to be one method of reducing the incidence of unwanted residues. (Author abstract by permission)

75-0771. Johnson, J. C., Jr.; Jones, R. L.; Leuck, D. B.; Bowman, M. C.; Knox, F. E. (Dept. Anim. Sci., Georgia Coastal Plain Exp. Sta., Tifton, GA 31794). **Persistence of chlorpyrifos-methyl in corn silage and effects of feeding dairy cows the treated silage.** *J. Dairy Sci. 57(2): 1476-1473; 1974.* (6 references)

Corn was sprayed in the field at dent stage of maturity with chlorpyrifos-methyl [*O,O*-dimethyl-*O*-(3,5,6-trichloro-2-pyridyl)phosphorothioate] at concentrations of .56, 1.12, and 2.24 kg/hectare and ensiled 1 day later. Losses of total residues, including the pyridinol hydrolysis product of chlorpyrifos-methyl, through 83 days of ensiling were equivalent to 55, 71, and 76% of that applied, respectively. Starting 83 days post ensiling, control and treated silages were fed to 16 cows, 4 per treatment, for 42 days during which chlorpyrifos-methyl averaged .35, .87, and 1.85 ppm and was stable. The pyridinol averaged .44, .79, and 1.75 ppm but continued to decline and during the last week of feeding averaged only 32% of that in silage fed during the first week. Residue intakes amounted to .009, .022,

and .054 mg chlorpyrifos-methyl and .012, .020, and .051 mg of pyridinol/kg body weight and did not affect silage intake, milk production, blood cholinesterase activity, or gains in body weight. Traces of chlorpyrifos-methyl (.003 ppm or less) were found in milk from cows only on the 2.24 kg treatment. Milk from all cows fed treated silage contained traces of the pyridinol (.011 ppm or less). No trace of the *O*-analog of chlorpyrifos-methyl was present in any sample, and all milk, feces, and urine were free of residues within 1 wk after the cows were withdrawn from treated silage.

75-0772. Lincer, J. L.; Sherburne, J. A. (Mote Marine Lab., Sarasota, FL 33581). **Organochlorines in kestrel prey: a north-south dichotomy.** *J. Wildl. Manage. 38(3): 427-423; 1974.* (50 references)

Microtines were found most frequently in pellets of American kestrels (*Falco sparverius*). The low DDE residue levels found in these microtines (0.01 ppm, wet weight) and other prey species from the Ithaca, New York area cannot explain the high residues found in the kestrel eggs. The hypothesis that heavily contaminated kestrels accumulate high residues from prey on their more southern wintering grounds is not contradicted by an analysis of bird-banding returns and residue data in the literature. (Author abstract by permission)

75-0773. Une, F.; Morita, H.; Akimoto, T.; Oshima, Y. (Daiichi Seiyaku (Pharmaceuticals) Co., Ltd., Japan). **[Pesticide residues (BHC, DDT, polychlorocyclodienes) in solid feeds for experimental animals.]** *Jikken Dobutsu (Exp. Anim.) 2(3): 197-198; 1974.* (Japanese)

Pesticide residues were determined in commercial solid feeds for experimental animals. The residues were extracted by benzene-acetone following the methods based on those of the FDA and National Institute of Hygienic Science of Japan and determined by ECD-GC. In the feeds for mice and rats for which determination was carried out for 4 years from 1970 to 1973, total BHC showed a decrease from 0.104 ppm in 1970 to 0.032 ppm, however, in spite of the decrease of α-isomer, two isomers, β- and γ-isomer, showed almost no decrease. Dieldrin and DDT showed a slight decrease and aldrin and endrin levels were below the detectability limit.

75-0774. Gilbertson, M. (Canadian Wildlife Serv., Ottawa, Ontario, Canada). **Seasonal changes in organochlorine compounds and mercury in common terns of Hamilton Harbour, Ontario.** *Bull. Environ. Contam. Toxicol. 12(6): 726-732; 1974.* (8 references)

Thirty-two eggs or newly hatched chicks (laid or emerging from eggs laid between May and July 1971) and five adults (captured between April and June 1971) of the species *Sterna hirundo* (Common Tern) were analyzed for organochlorine substances and mercury. The samples were collected from colonies on two artificial islands in Hamilton Harbour, Ontario. In the eggs and chicks, there was a good correlation between date and DDE concentration; HCB and dieldrin increased in a similar manner. The product moment correlation between PCB and the date was not significant, although the correlation between PCB concentration and DDE concentration was. Similar results were found in the adult terns. In the breast muscle of the adults the mercury concentration was significantly correlated with the date, but not in the eggs or chicks. The organochlorine substances and mercury appear to have been ingested mainly in the vicinity of the colony.

75-0775. Linko, R. R.; Rantimaki, P.; Urpo, K. (Dept. Biochem., Univ. Turku, Turku, Finland). **PCB residues in plankton and sediment in the southwestern coast of Finland.** *Bull. Environ. Contam. Toxicol. 12(6): 733-738; 1974.* (7 references)

Plankton specimens were collected from the Turku Archipelago off the southwestern coast of Finland in the summer and autumn of 1972 and 1973. The frozen samples were partially thawed and the fat extracted and subjected to GLC analysis for pesticide residues. The plankton contained relatively high concentrations of PCBs (average 0.19 ppm on a wet weight basis and 25 ppm on a lipid basis); the concentrations were similar to those in fish from the same region. Plankton collected by surface catching tended to have lower PCB values than those taken by depth catching. Sources of PCB pollution in the Turku Archipelago may be local input from ships and boats as well as sewage sludge.

75-0776. Davis, B. N. K. (Monks Wood Exp. Sta., Abbots Ripton, Huntingdon, England). **Levels of dieldrin in dressed wheat seed after drilling and exposure on the soil surface.** *Environ. Pollut. 7(4): 309-317; 1974.* (8 references)

Counts of exposed wheat grains were made on 7 fields; 4 of fen peat soils, 2 of boulder clay soil, and 1 of an alluvial sandy loam, after autumn drillings in the Huntingdon area to examine the effects of soil tilth and cultivation practices. High exposed seed counts were correlated with shallow harrowing, recent rainfall at the time of sowing, and heavy soil texture. In all cases the wheat was dressed with PP mercury dieldrin at the rate of 2 oz/bushel (1.95 g/kg) of 60% technical dieldrin. The level of dieldrin seed dressings on the grain was studied on 4 fields. Seed taken from the hopper of the drill had up to 60% of the theoretical dose and a considerable loss of pesticide was noted during the first day or two after drilling. Hazards to wild birds and mammals are discussed. It is recommended that light harrowing be used immediately after drilling.

75-0777. Nakagawa, M.; Crosby, D. G.* (Dept. Environ. Toxicol., Univ. California, Davis, CA 95616). **Photo-**

nucleophilic reactions of nitrofen. *J. Agr. Food Chem. 22(6): 930-933; 1974.* (31 references)

The sunlight photolysis of nitrofen (2,4-dichlorophenyl *p*-nitrophenyl ether) in aqueous methanol represents a photonucleophilic displacement of nitrophenate by the hydroxide ion of water. In the presence of potassium cyanide, irradiation of nitrofen resulted in 2,4-dichlorobenzonitrile and related compounds, while the photoreaction with piperidine provided *p*-nitrophenol as well as tarry products from the further reactions of intermediate 2,4-dichlorophenol with the amine. 2,4-Dichlorophenol also reacted with cyanide to form 2,4-dicyanophenol (4-hydroxyisophthalonitrile). These and other photonucleophilic reactions may help to explain the environmental dissipation of many pesticides. (Author abstract reprinted by permission of the American Chemical Society)

75-0778. Spencer, W. F.; Cliath, M. M. (Agr. Res. Serv., Univ. California, Riverside, CA 92502). **Factors affecting vapor loss of trifluralin from soil.** *J. Agr. Food Chem. 22(6): 987-991; 1974.* (25 references)

Trifluralin vapor pressure increased approximately five times for each 10-degree increase in temperature between 20 and 40°. Vapor density in Gila silt loam increased as trifluralin concentration increased and reached a saturated vapor density equal to that of trifluralin without soil at approximately 73 μg/g when the soil water content was 19%. Vapor density was markedly less in drier soils. Vapor density was inversely related to soil organic matter content. Volatilization rates measured by trapped vaporized trifluralin indicated that trifluralin vaporized more rapidly when surface applied than when incorporated into the soil. For example, when 14 kg/ha was incorporated into 10 cm of soil, the loss rate during the first 24 hr was only 0.0517 kg/ha per day. Surface applications of 1-10 kg/ha to a wet soil surface resulted in loss rates up to 4.0 kg/ha per day. Application to a dry soil surface resulted in essentially no volatilization. (Author abstract reprinted by permission of the American Chemical Society)

75-0779. Bemelmans, J. M. H.; Ten Noever de Brauw, M. C. (Cent. Inst. Nutr. Food Res. TNO, Zeist, The Netherlands). **Chloroanisoles as off-flavor components in eggs and broilers.** *J. Agr. Food Chem. 22(6): 1137-1138; 1974.* (8 references)

Musty eggs and broilers were analyzed for the presence of chloroanisoles and chlorophenols. The taint was caused by tri- and tetrachloroanisole. The contamination of the poultry products was brought about either by the use of woodshavings or by the use of contaminated feed. (Author abstract reprinted by permission of the American Chemical Society)

75-0780. Atallah, Y. H.; Dorough, H. W.* (Dept. Entomol, Univ. Kentucky, Lexington, KY 40506). **Insecticide residues in cigarette smoke. Transfer and fate in rats.** *J. Agr. Food Chem. 23(1): 64-71; 1975.* (20 references)

A quantitative smoking system was devised for mainstream smoke collection or for delivery to the lungs of rats via the trachea. Percentage transfer of ^{14}C-labeled insecticide equivalents to the mainstream smoke of cigarettes impregnated with five different ^{14}C-labeled insecticides (carbaryl, carbofuran, leptophos, DDT, and mirex) was approximately the same per milliliter of smoke, 0.2-0.3% of the ^{14}C-labeled insecticide contained in the burned tobacco, with puff volumes of 35 and 5 ml. Thirty-five milliliter puffs represent the average puff volume of man while a 5-ml puff was the volume administered to rats. Total recovery (ash, butt, sidestream smoke, and mainstream smoke) ranged from 88 to 102% of the ring-^{14}C-labeled insecticides added to that tobacco subsequently burned during the smoking process. Rats were administered eight 5-ml puffs at 15-sec intervals from cigarettes impregnated with the radioactive insecticides. Results are presented relative to levels of radiocarbon in the exhaled air, lungs, blood, and heart following the smoking process. (Author abstract reprinted by permission of the American Chemical Society)

75-0781. Demint, R. J.; Pringle, J. C., Jr.*; Hattrup, A.; Bruns, V. F.; Frank, P. A. (Agr. Res. Serv., U.S. Dept. Agr., Denver Federal Cent., Denver, CO 80225). **Residues in crops irrigated with water containing trichloroacetic acid.** *J. Agr. Food Chem. 23(1): 81-84; 1975.* (10 references)

Ten field and vegetable and three fruit crops were irrigated with water that contained about 0.1 and 0.5 ppm of trichloroacetic acid (TCA). Grapes were treated at 0.17 and 1.39 ppm. TCA residues were not detected in peaches, sugar beets, wheat, or tomatoes. Minute amounts of TCA (0.01-0.04 ppm) were detected in alfalfa, corn, garden peas, potatoes, and watermelon treated at 0.5 ppm. Slightly higher residues of TCA, ranging from 0.13 to 0.43 ppm, were detected in field-bean pods and seed, and snapbean herbage treated at 0.5 ppm. Apples treated at 0.1 ppm contained 0.19 ppm of residue, and grapes contained 0.03 and 0.20 ppm when treated at lower and higher rates, respectively. Of the two crops that were sprinkler and furrow irrigated with TCA-treated water, the only difference was in pods of furrow-irrigated field-beans, which contained maximum TCA residues of 0.19 ppm compared to pods of sprinkler-irrigated beans, which contained 0.03 ppm. At harvest, residues had disappeared from most crops, except apples, field-bean pods and seed, garden peas, and grapes, which contained 0.19, 0.19, 0.13, 0.02, and 0.20 ppm of TCA, respectively. (Author abstract reprinted by permission of the American Chemical Society)

75-0782. Braun, H. E.; McEwen, F. L.; Frank, R.; Ritcey, G. (Provincial Pestic. Residue Testing Lab., Univ.

Guelph, Guelph, Ontario, Canada). **Residues of leptophos and its metabolites following application to various crop plants.** *J. Agr. Food Chem. 23(1): 90-95; 1975.* (2 references)

Leptophos was applied to 13 crops in the early stage of growth and to crucifers in a weekly schedule. Samples were collected at harvest and analyzed for leptophos. Residue levels in beans, cabbage, cauliflower, celery, corn, onions, pea pods, and rutabagas were found to be less than 0.1 ppm where the insecticide had been applied in the early stage of plant growth; higher levels were found in broccoli, lettuce, and carrots; pea vines were found to contain the highest residues at harvest. Where multiple applications of leptophos were made to cabbage, cauliflower, and broccoli on a 7-day schedule, residues at 2 days after the final application ranged from 1.9 to 4.6 ppm. Residues were highest on broccoli and were still present in excess of 1 ppm after 13 days. Residue consisted predominantly of the parent compound with leptophos oxon and 4-bromo-2,5-dichlorophenol accounting for only a small proportion of the total residue recovered. (Author abstract reprinted by permission of the American Chemical Society)

75-0783. Dumas, T.; Bond, E. J. (Res. Inst., Canada Dept. Agr., London, Ontario, Canada). **Bromide residues in apples fumigated with ethylene dibromide.** *J. Agr. Food Chem. 23(1): 95-98; 1975.* (6 references)

When three varieties of apples were fumigated with 8-24 mg/l% of ethylene dibromide for 4 hr at 13° and held at this temperature the ethylene dibromide in the edible portion (skin and pulp) desorbed to a level below 0.1 ppm in less than 13 days. In the seeds 30 ppm of ethylene dibromide was found immediately after treatment and this did not desorb during 13 days of storage at 13°. In apples stored at 4° after treatment desorption of ethylene dibromide was slower than in apples held at 13°, taking nearly 4 weeks to reach the 0.1-ppm level. The inorganic bromide residue found after the desorption of organic bromide was below 5 ppm even in apples fumigated at twice the required dosage. (Author abstract reprinted by permission of the American Chemical Society)

75-0784. Onuska, F. I.; Comba, M. E. (Inland Waters Directorate, Anal. Methods, Res. Subdiv., Dept. Environ, Burlington, Ontario, Canada). **Isolation and characterization of the photoalteration products of *cis*- and *trans*-chlordane.** *J. Ass. Offic. Anal. Chem. 58(1): 6-9; 1975.* (7 references)

Ultraviolet irradiation of *cis*- and *trans*-chlordane yielded 3 photolysis products. The expected half-caged analog of *cis*-chlordane was formed in high yield, and 2 minor photoproducts of *trans*-chlordane were observed. One of these products was a half-caged isomer. The individual photoproducts were isolated by thin layer chromatography and characterized by infrared, nuclear magnetic resonance, and mass spectrometry. (Author abstract by permission)

75-0785. Del Vecchio, V.; Leoni, V.; Puccetti, G.; Caratozzolo, C.; Simeone, A. M. (Istituto d'Igiene "G. Sanarelli", Univ. di Roma, Rome, Italy). **Indagini sul contenuto di pesticidi cloro-organici in diete totali in Italia. Parte I: Alimenti non preparati. [Investigation of organochlorine pesticide content in total diet in Italy. I. Unprepared food.]** *Nuovi Ann. Ig. Microbiol. 24(1): 1-41; 1973.* (20 references) (Italian)

The organochlorine pesticide contents in some one thousand unprepared food products collected from markets and stores in Milan, Rome, and Naples in the 1971-1972 period were measured to determine the average daily intake of different pesticides in the total diet in Italy. The samples were taken from the edible portions for gas chromatographic analysis. The total daily intake per person was determined to be 14.2 μg for total BHC; 4.6 μg for lindane; 2.6 μg for aldrin plus dieldrin; 8.1 μg for heptachlor plus heptachlor epoxide; 1.9 μg for chlordane, and 51.4 μg for total DDT. The daily intake determined for lindane and dieldrin is 0.6% and 43.5% of the respective ADI values proposed by FAO-WHO in 1972.

75-0786. Harvey, G. R. (Dept. Chem., Woods Hole Oceanogr. Inst., Woods Hole, MA 02543). **DDT and PCB in the Atlantic.** *Oceanus 18(1): 19-23; 1974.*

Chlorinated hydrocarbon distribution in the sea was studied by collecting fish and crustacea from the North Atlantic in 1970. Ten to 100 times more PCB was found than DDT, suggesting that DDT is not as persistent as once believed, and is confined fairly closely to its point of introduction. DDT half-life in naturally illuminated seawater is about 10 days, thus, DDT is now undetectable in Atlantic deep-sea water or sediments. However, PCB was measurable in sediments lying under 5500 meters (18,000 feet) of water. Along the U.S. coast DDT is more abundant and is detectable in sediments, shellfish, and finfish. No decrease in the chlorinated hydrocarbon content in water or in plankton was noted as one went seaward. However, a rapid decrease in concentrations away from the coast was recorded in the air over the Atlantic and in sediments beneath the water. While falling to the sediments solid particles in coastal water may adsorb PCB and DDT. The greater concentration of these solid particles near the coast may thus account for the lack of higher concentrations of PCB and DDT in coastal waters. Evidence indicates that food chain magnification of pollutants does not occur in water-breathing animals. No adverse effects on plankton distribution or size of fish catches was noted. Due to pressure from scientific and citizen groups arising in the later 1960s, harmful situations are improving. Suggestions for future use of agricultural chemicals are offered.

75-0787. Machin, A. F.; Mundy, D. E.; Quick, M. P.; Janes, N. F. (Cent. Vet. Lab., Min. Agr., Fisheries and Food, New Haw, Weybridge, Surrey, England). **Esterase-inhibiting photo-oxidation products from the organophosphorus insecticide pyrimithate.** *Pestic. Sci. 5: 741-748; 1974.* (18 references)

Pyrimithate (2-dimethylamino-6-methylpyrimidin-4-yl diethyl phosphorothionate) decomposes when exposed to UV light in the presence of air to a complex mixture of products, some of which inhibit esterases directly or indirectly. Separation of the mixture by thin-layer and liquid chromatography gave five pure components in sufficient quantity for spectroscopic identification. A sixth was tentatively identified. The structures identified show that oxidative attack occurs at the dimethylamino group and at the sulphur atom. (Author abstract by permission)

75-0788. Lokke, H. (Nat. Food Inst., Dept. Food Additives, Pesticides and Contaminants, DK 2860 Soborg, Denmark). **Residues in carrots treated with linuron.** *Pestic. Sci. 5: 749-757; 1974.* (19 references)

Investigations have been carried out on residues of linuron and its breakdown products in carrots sprayed with linuron at 1, 2, or 4 kg a.i./ha, 0, 19, 28, 36, or 60 days after sowing (up to 57 before harvesting). The extracted residues were separated into three fractions by liquid-liquid partitioning: linuron; 3-(3,4-dichlorophenyl)-1-methoxyurea, 3-(3,4-dichlorophenyl)-1-methylurea, and 3,4-dichlorophenylurea; and 3,4-dichloroaniline. The compounds in each fraction were hydrolyzed and the iodine derivative 1,2-dichloro-4-iodobenzene was formed by a Sandmeyer reaction between 3,4-dichloroaniline and iodide ion, followed by gas chromatography with electron capture detector. Only 5–13% of the extractable residues were breakdown products. Most of the detectable residue (87-95%) was identified as linuron. The relative proportions of linuron and breakdown products in carrots at the time of harvest were not affected by the time of spraying or the interval between treatment and harvest. (Author abstract by permission)

75-0789. Horowitz, M.; Herzlinger, G.; Hulin, N. (Div. Weed Res., ARO, Newe Ya'ar Exp. Sta., Newe Ya'ar, Israel). **Effects of repeated applications of persistent soil herbicides.** *Phytoparasitica 1(1): 64; 1973.*

For 5 years, uncropped field plots on an alluvial clay soil were sprayed twice yearly (in spring and fall) with bromacil (4.0 or 8.0 kg/ha); DCPA (7.5 or 15.0 kg/ha); diphenamide (2.4 or 4.8 kg/ha); diuron (0.8 or 1.6 kg/ha); fluometuron (1.6 or 3.2 kg/ha); neburon (0.9 or 1.8 kg/ha); prometryne (0.5 or 1.0 kg/ha); pyrazon (1.6 or 3.2 kg/ha); simazine (0.75 or 1.5 kg/ha); and trifluralin (incorporated, 0.67 or 1.34 kg/ha). Emerged weeds were controlled with paraquat. In the summer, the plots were sprinkler-irrigated once monthly. No qualitative change in specific herbicidal activity was recorded. Six months after the sixth application, the following herbicide concentrations (ppm) were found in the 0-15 cm soil layer, for the lower and high dose, respectively: 1.4 and 2.5 bromacil; 1.0 and 1.5 diuron; 1.3 and 2.3 fluometuron; 0.6 and 1.3 neburon; 0.3 and 0.5 simazine; and 0.6 trifluralin (high dose). Six months after the seventh application, residues with medium to strong phytotoxicity were detected as follows: bromacil, down to the 60-cm depth; diuron, fluometuron, and simazine, down to 45 cm; neburon, down to 15 cm (low dose) and 45 cm (high dose); prometryne, pyrazon, and trifluralin, down to 15 cm. The sprayed plots did not differ from untreated controls in terms of $N\text{-}NH_4$ or $N\text{-}NO_3$ content. Similar results were found using loess soil.

75-0790. Koren, E.; Shlevin, E. (Palimport Ltd., Tel Aviv, Israel). **Effect of trickle irrigation on soil-applied herbicides.** *Phytoparasitica 1(1): 80-81; 1973.*

The effect of trickle irrigation on the activity, leaching, and distribution in the soil of various herbicides was studied in the laboratory and under field conditions. The pattern of movement of a soil-applied herbicide under trickle irrigation to some extent paralleled that of the trickle water itself, but the total herbicide movement was less than that of the water. Both water and herbicide distribution in the soil formed the shape of a hemisphere or cone under the trickle nozzle, the exact shape being determined by the soil characteristics. The herbicides moved from the treated surface into deeper soil layers throughout the wet profile, although there was no direct downward movement of the water to leach them. Very deep leaching of the herbicides was noted directly under the trickle nozzle, where the movement of the water was predominantly vertical. Repeated irrigations might therefore lead to the accumulation of herbicides in deep zones of the soil, where they can be phytotoxic to deep-rooted crops such as fruit trees. All herbicides tested showed essentially the same pattern of movement under trickle irrigation but showed quantitative differences which were apparently due to differences in physical properties.

75-0791. Agnihotri, V. P.; Singh, K.; Budhraja, T. R. (Indian Inst. Sugarcane Res., Lucknow, India). **Persistence and degradation of vitavax in soil and sugarcane setts and its effect on soil fungi.** *Proc. Indian Nat. Sci. Acad. 39(5B): 561-568; 1973.* (18 references)

Persistence of vitavax (carboxin) in soil appears related to the amount of fungicide initially applied. At 17.5 kg/ha, the fungicide was fully degraded between 20 and 24 days, while at 35 kg/ha, 32 to 36 days were required. Several degradation products of vitavax were recorded by thin-layer chromatography. The *Rf* values of degradation products were lower than the *Rf* value of

vitavax. The fungicide was absorbed by roots of germinating setts and the compound and its degradation products were then translocated to different parts, viz., node, internode, bud, and leaf. The fungicide was decomposed rapidly in plant parts and was completely broken down yielding several compounds within 7 days. The fungicide proved highly toxic to Basidiomycetes, and mycelial growth of *Ustilago scitaminea* was arrested at 2.5 ppm. Germination of spores was drastically reduced at 5 ppm. Several common rhizosphere fungi of sugarcane degraded vitavax in vitro.

75-0792. Thimann, K. V. (Thimann Labs., Div. Natural Sci., Univ. California, Santa Cruz, CA 95064). **Herbicides in Vietnam.** *Science 185(4147): 207; 1974.*

No evidence of birth defects attributable to spraying herbicides in Vietnam was found in the records of any of the Vietnamese hospitals examined. There was no evidence of the persistence of herbicide residues in the soil of any of the sprayed areas. There was no medical evidence to support claims that any Montagnard children had died from the spraying. The estimate of merchantable forest trees killed appears to have been previously exaggerated by a factor of 10. The claim that undesirable bamboos had invaded the defoliated parts of the forest could not really be substantiated or denied, but appeared questionable. The claim that mangroves in the coastal areas will not regenerate for 100 years is without foundation.

75-0793. Smith, R. J., Jr. (Agr. Res. Serv., U.S. Dept. Agr., Stuttgart, AR 72160). **Responses of rice to postemergence treatments of propanil.** *Weed Sci. 22(6): 563-568; 1974.* (15 references)

In a 3-year study propanil (3′,4′-dichloropropionanilide) at 6.7 or 9.0 kg/ha was applied postemergence as single or split applications to rice (*Oryza sativa* L. 'Starbonnet' and 'Nova 66') 15 to 75 days after crop emergence. The effect on crop injury, maturity, grain yield, and seed and milling quality was measured on rice grown in weed-free plots. Residues of DCA (3,4-dichloroaniline) in grain and straw from treated rice plants and of propanil and TCAB (3,3′,4,4′-tetrachloroazobenzene) in treated soil were determined. Propanil applied at all times and rates in 1968 and 1970 or applied at all rates at 15 to 55 days after crop emergence in 1969 did not reduce grain yields, but 6.7 kg/ha applied 65 and 75 days after crop emergence in 1969 injured rice plants vegetatively and reduced grain yields. Plant maturity, seed viability and milling quality of grain were not affected. Residues of DCA in grain and straw were highest from treatments applied 65 to 75 days after crop emergence; rice straw contained more DCA than did grain. (Author abstract by permission)

75-0794. Wu, C. H.; Santelmann, P. W.; Davidson, J. M. (Dept. Agron., Oklahoma State Univ., Stillwater, OK 74074). **Influence of soil temperature and moisture on terbutryn activity and persistence.** *Weed Sci. 22(6): 571-574; 1974.* (9 references)

The phytotoxicity of soil-applied terbutryn [2-(*tert*-butylamino)-4-(ethylamino)-6-(methylthio)-*s*-triazine] to wheat (*Triticum aestivum* Vill.) was significantly affected by soil moisture and soil temperature. Distribution coefficients (*Kd*) provided a better indication of the phytotoxicity of terbutryn to wheat than any single measured parameter contributing to herbicide adsorption by the soil. Soil temperatures and soil moisture levels suitable for good plant growth tended to enhance the phytotoxicity of terbutryn. No phytotoxic levels of terbutryn to wheat were detected in Teller sandy loam after 20 weeks of incubation at above 10 C and 14% soil moisture by weight. However, phytotoxicity to wheat was observed in air-dry terbutryn-treated soil after an incubation period of 20 weeks, regardless of incubation temperature. Significant quantities of terbutryn may remain in the field under dry soil conditions. (Author abstract by permission)

75-0795. Skroch, W. A.; Sheets, T. J.; Monaco, T. J. (Dept. Hort. Sci., North Carolina State Univ., Raleigh, NC 27607). **Weed populations and herbicide residues in apple orchards after 5 years.** *Weed Sci. 23(1): 53-57; 1975.* (17 references)

Weed population shifts occurred when simazine (2-chloro-4,6-bis(ethylamino)-*s*-triazine), diuron (3-(3,4-dichlorophenyl)-1,1-dimethyl-urea), terbacil (3-*tert*-butyl-5-chloro-6-methyluracil), and dichlobenil (2,6-dichlorobenzonitrile) were applied annually for 5 years to an apple orchard. The number of brambles (*Rubus sp.*) and Virginia clematis (*Clematis virginiana* L.) plants increased with terbacil usage. Bramble populations increased with the high rate of dichlobenil and goldenrod (*Solidago sp.*) increased at the low rate. The major vegetation on plots receiving amitrole (3-amino-*s*-triazole) was not altered from that of a mowed check. However, amitrole reduced growth of shallow planted trees. Postemergence applications of paraquat (1,1′-dimethyl-4,4′-bipyridinium ion) four times during each growing season resulted in more bare soil than was in the mowed checks at the end ot the fifth growing season. Yields of apples were higher in the simazine, terbacil, and dichlobenil-treated plots than in the mowed checks. Simazine and terbacil residues did not accumulate in the upper 60 cm of soil during the study; a slight accumulation of dichlobenil appeared to occur in the surface 0 to 15 cm. (Author abstract by permission)

75-0796. FAO Working Party of Experts on Pesticides Residues and WHO Expert Committee on Pesticide Residues. (World Health Organization, Geneva, Switzerland). **Pesticide residues in food.** *World Health Organ. Tech. Rep. Ser. 545, 1974. 43 p.* (23 references)

The problem of pesticide residues in food was

discussed in terms of principles and scope; testing procedures; terminology; the significance of figures relating to accepted daily intakes; residue limits; the significance of the development of liver-cell tumors in mice; the toxicity of cholinesterase-inhibiting substances; pharmacokinetic and enzyme kinetic studies on organophosphorus compounds; the testing of pesticides for mutagenicity; the assessment of pesticides having the same or similar metabolites; hexachlorobenzene (HCB); evaluation of data for acceptable daily intakes of organophosphorus insecticides, benzimidazole fungicides, methylcarbamate insecticides, and other miscellaneous pesticides; the evaluation of data for residue limits; future work; and recommendations. Appended are recommendations concerning acceptable daily intakes and residue limits made at the 1973 Joint Meeting, and further work or information needed.

75-0797. Schmid, A. (Sta. Fed. Rech. Agron. Changins, Nyon, Switzerland). **Untersuchungen ueber die Umweltpersistenz des Granulosisvirus des Grauen Laerchenwicklers *Zeiraphera diniana* (Gn.) und die Schutzwirkung verschiedener Stoffe. [Investigations of the persistency of the granulosis virus of the larch bud moth *Zeiraphera diniana* (Gn.) and the protective action of some substances.]** *Z. Angew. Entomol. 76(1): 31-49; 1974.* (31 references) (German)

The persistence of granulosis virus spray, used to control *Zeiraphera diniana* (Gn.) in larch buds, was studied on larch trees in the Engadine (1,800 m above sea level) and in Zurich (600 m). Rapid inactivation of the virus spray by short-wave sunlight, and by sunlight in general, was observed. Light-absorbing substances, e.g. 2% dried skim milk powder or 1% milk plus 1% india ink, which were added to the virus suspension slowed down the inactivation process considerably. Similar results were obtained with 2% sucrose but the mechanism of its protective action is not well understood. Buffering of virus suspensions or rain had little effect. The same was true concerning secondary plant substances possibly emanating from the larch tree. Even when protected by these substances, at 1,800 m above sea level, inactivation of the virus sprays proceeded so quickly that there was little chance of the virus persisting from one year to the next sufficiently for the release of an epizootic. Two virus suspensions with and without phosphate buffer had the same infective potency after 15 months storage at 2°C. A freeze-dried sample of a virus suspension containing 5% cellulose powder was 3.5 times more infective after 8 months at 2°C than a sample of the same suspension stored at the same temperature in liquid form.

75-0798. Erne, K. (Statens Veterinaermed. Anstalt, Stockholm, Sweden). **Unkrautmittel und Wild—Einige neuere Ergebnisse. [Weed-killers and wildlife—some recent results.]** *Z. Jagdwissenschaft 20(1): 68-70; 1974.* (German)

Residues of herbicides, such as 2,4-D and 2,4,5-T, were studied in leaf vegetation, water bodies, fish, and game in Lapland, Sweden. In leaf vegetation sprayed with phenoxy herbicides, relatively high residue levels of 30-60 ppm were found. The residues persisted for up to two years in leaves under certain circumstances. Residues found in wild berries and mushrooms were moderately high. Phenoxy herbicide residues were found in concentrations usually lower than 0.01 ppm in 25% of all surface water samples. Phenoxy herbicides occurred infrequently in fresh-water fish, reaching concentrations of up to 1.5 ppm. In game found dead or shot in herbicide-treated woodland areas phenoxy herbicide residues were found occasionally, usually below 1 ppm. Toxicity tests indicated the acute and chronic toxicities of 2,4-D and 2,4,5-T in reindeer to be comparable to those observed in laboratory animals. Feeding phenoxy-herbicide treated leafy plants to hares and pregnant reindeer for a few months did not cause changes in health or, in reindeer, late fetal development.

75-0799. Brueggemann, J.; Busch, L.; Drescher-Kaden, U.; Hoppe, P. (Inst. Tierphysiol., Munich Univ., Munich, Germany). **Pesticid- und PCB-Rueckstaende in Organen von Wildtieren als Indikatoren fuer Umweltkontamination. [Pesticides and PCB residue in the organs of wild animals as indications of environmental contamination.]** *Z. Jagdwissenschaft 20(1): 70-74; 1974.* (German)

A total of 800 organ, adipose tissue, and egg samples from 26 wild animal species collected in 1970-1973 were analyzed for organochlorine and PCB residues by gas-chromatographic method. Lindane and its isomers were detected in 94.5%, BHC in 96.5%, aldrin plus dieldrin in 82.4%, *p,p'*-DDE in 87.8%, heptachlor plus heptachlor epoxide in 73.8%, and DDT and its isomers in 54.2% of all liver samples. The corresponding percentages for adipose tissue samples were 91%, 98.5%, 71.2%, 70.7%, 76.6%, and 53.7%. Aldrin plus dieldrin, PCBs, BHC, and *p,p'*-DDE were found in all eggs, and 88.7% of all egg samples also contained lindane and its isomers. The pesticide and PCB levels in liver and fat samples from herbivora were lower by about five times (in the ppb range) than in carnivora in which the residues accumulated via the trophic chain. The pesticide residue levels were highest in eggs of predatory birds and in codfish liver-in the ppm range.

75-0800. Imre, R. A.; Berencsi, G. (Inst. Hyg. Epidemiol., Med. Univ., Szeged, Hungary). **Methoxyaethyl-mercury-chlorid-haltige Beizmittel-Wirkstoffueberreste in der Umwelt. [Residues of active principle of a seed treatment solution containing methoxyethyl mercury chloride in the environment.]** *Zentralbl. Bakteriol. Parasitenk. Infektionskr. Hyg. Abt. I 159(2): 178-188; 1974.* (36 references) (German)

Contamination by methoxyethyl mercury chloride-containing seed dressing agents, such as Ceresan

Universal and Merchlorate, in the environment was studied. In the agricultural areas studied, grain treated with these organomercurial fungicides was sown for 4 consecutive years. The upper 20 cm soil layer contained an average mercury level of 0.20 ppm. The initial enrichment of mercury in tillers was 0.90 ppm which gradually decreased by 90% to 0.10 ppm from December to May. In kidneys from brown hares found dead or killed in the test area, an average mercury level of 4.9 ppm was found, while the mercury level in the liver averaged 1.7 ppm. These results demonstrate the contamination by organomercurial fungicides in soil and animals via plant tillers. Mercury was found to accumulate in the animals to exceed the biological background concentration without constituting an acute poisoning hazard.

75-0801. Weil, L.; Dure, G.; Quentin, K. E. (Inst. Wasserchem. Chem. Balneol., Tech. Univ. Munich, Munich, Germany). **Wasserloeslichkeit von insektiziden chlorierten Kohlenwasserstoffen und polychlorierten Biphenylen im Hinblick auf eine Gewaesserbelastung mit diesen Stoffen. [Water-solubility of chlorinated hydrocarbons and polychlorinated biphenyls used as insecticides with regard to water pollution.]** *Z. Wasser-Abwasser Forsch. 7(6): 169-185; 1974.* (17 references) (German)

A simple, reproducible method for the determination of the water-solubility of organochlorine pesticides and PCBs is described, and water-solubility values of pesticides and PCBs determined by this method are presented. The method, suitable for the determination of the water-solubility in a range of 1 mg to 0.001 μg/l, is based on the elution of the compound from coated Florisil (magnesium-silica gel) in a chromatographic column by water. The water-solubility was determined to be 17 μg/l for aldrin, 1,850 μg/l for chlordane, 9 μg/l for clophen A 60, 20 μg/l for *p,p'*-DDD (TDE), 14 μg/l for *p,p'*-DDE, 5.5 μg/l for DDT, 26 μg/l for *o,p'*-DDT, 200 μg/l for dieldrin, 530 and 280 μg/l for alpha- and beta-endosulfan, respectively, 260 μg/l for endrin, 5 μg/l for BHC, 2,000 μg/l for α-BHC, 240 μg/l for β-BHC, 7,800 μg/l for lindane, 31,400 μg/l for δ-BHC, 350 μg/l for heptachlor epoxide, 1,320 μg/l for kelthane, 100 μg/l for methoxychlor, and 740 μg/ml for toxaphene.

75-0802. Khan, S. U. (Chem. Biol. Res. Inst., Canada Dept. Agr., Ottawa, Ontario, K1A OC6, Canada). **Humic substances reactions involving bipyridylium herbicides in soil and aquatic environments.** *Residue Rev. 52: 1-26; 1974.* (71 references)

General properties of humic substances and bipyridylium herbicides are outlined briefly. The adsorption of paraquat and diquat by soil organic matter, charcoal, and organo-clay complex is treated briefly. The literature pertaining to the adsorption of bipyridylium herbicides by humic substances is reviewed and the effects of such factors as equilibrium time, temperature, and the presence of inorganic cations on the humic material is discussed. The competitive adsorption of diquat versus paraquat and diquat+paraquat versus inorganic cations is examined. The techniques used in adsorption studies are outlined. Evidence is presented for the involvement of ion-exchange and charge-transfer mechanisms in the adsorption of bipyridylium herbicides by humic substances. (Author abstract by permission)

75-0803. Lutomski, J.; Debska, W. (Inst. Med. Plants, 61-707 Poznan, Poland). **Pesticides residues in medicinal plants in Poland.** *Residue Rev. 52: 27-44; 1974.* (19 references)

Significant quantities of medicinal plants are produced in Poland. The Institute of Medicinal Plants sponsors research aimed at obtaining high quality products. Pesticides are applied to medicinal plant crops in accordance with agricultural guidelines. Chemical investigations revealed that the urea and triazine herbicides and organophosphorous insecticides used do not persist in medicinal plants. Application of organochlorine insecticides to medicinal plant cultures has been prohibited for years in Poland. However, environmental pollution by DDT and its metabolites results in deposition of these compounds in medicinal plants as well. The quality of raw materials harvested from natural sources is inferior to that gathered from cultures where there are fewer possibilities of accidental contamination. No major contaminations of root raw materials have been found, nor have any been found in those raw materials which are not strictly medicinal plants and are thus not subjected to the rigorous standards applied to medicinal plant raw materials. The permissible level of DDT contamination in medicinal plant raw materials has been established at 0.5 ppm. Methods are available for detecting residues of major pesticides from the groups of herbicides, insecticides, and fungicides in plant raw materials. (Author abstract by permission, edited)

75-0804. Engst, R.; Schnaak, W. (Cent. Inst. Nutr., Acad. Sci. Potsdam-Rehbrucke, DDR-1505). **Residues of dithiocarbamate fungicides and their metabolites on plant foods.** *Residue Rev. 52: 45-67; 1974.* (83 references)

A summarizing survey on residue problems with dithiocarbamate fungicides is given, considering especially the ethylene bis-dithiocarbamates. Following a brief introduction to the chemistry and toxicology of these pesticides, their degradation and metabolism are discussed in detail on the basis of existing results. In this connection the necessity of including toxic degradation products in the hygienic-toxicologic evaulation of residues is stressed. The most important methods for determining residues of undecomposed pesticides and their degradation products are presented in detail. Thin-layer and paper chromatographic, photometric, polarometric, and gas chromatographic methods were espe-

cially considered. Concluding statements on residue dynamics describe the quality and quantity of residual substances occurring after dithiocarbamate treatment as well as the role of degradation products. (Author abstract by permission, edited)

75-0805. Gerakis, P. A.; Sficas, A. G. (Dept. Agron., Univ. Thessaloniki, Greece). **The presence and cycling of pesticides in the ecosphere.** *Residue Rev. 52: 69-87; 1974.* (101 references)

When pesticides are applied to plants and soil, small portions may drift in the atmosphere and contaminate very remote areas. Part of the pesticide may be photochemically degraded before it reaches the plants and soils. Part of the pesticide reaching the plant-soil system will be lost to the atmosphere by evaporation and codistillation, part will be photochemically degraded, and the rest will enter plants and soil and will either be degraded there or persist almost indefinitely. Persistence will depend on the chemical structure of the pesticide itself and on a multitude of interacting environmental factors. The fates of pesticides entering the plant tissue may be, first, immediate metabolic degradation, second they may become a part of the soil system after plant residue incorporation and burning, and third, they may enter the food chain and contaminate remote areas. Burning may also contaminate the atmosphere. The pesticide which has found its way into the soil by direct application, by plant incorporation and burning, and by accidental atmospheric drift may be partly taken up by the plant roots or be degraded biochemically by soil microorganisms or even chemically. Another part may be lost through volatilization and through transport by water and wind. At any rate, biodegradation in the soil is the major cause of pesticide disappearance from the ecosphere and follows similar pathways whether it is effected by microorganisms, plants, or animals. Water transport of pesticides is chiefly through surface runoff and it may cause contamination of lower-lying areas and of water bodies. Water contamination may also occur from accidental spills, industrial waste discharges, purposeful direct application, sewage discharges, air drift, etc. Once a pesticide enters a water body it may be volatilized, remain in the water in solution or suspension, or precipitate as sediment. (Author abstract by permission, abridged)

See also **75-0810** **75-0820** **75-0906**

75-0806. Haque, R.; Freed, V. H. (Dept. Agr. Chem., Oregon State Univ., Corvallis, OR 97331). **Behavior of pesticides in the environment: "Environmental chemodynamics".** *Residue Rev. 52: 89-116; 1974.* (108 references)

This review describes the important factors responsible for the behavior of pesticides in air, water, soils, and biota. The findings of the authors as well as of others in this research area are documented. Emphasis was given to the importance of some of the physical-chemical properties of pesticides such as water solubility, enthalpy of solution, vapor pressure, heat of vaporization, kinetics and thermodynamics of adsorption, leaching, diffusion, photochemical decomposition, microbial decomposition, chemical decomposition, and partitioning of chemicals in biopolymers in describing pesticide behavior in the environment. These physical-chemical parameters may be used to describe the persistence as well as the over-all environmental impact of a chemical. It is hoped that this review may help to provide a foundation for the emerging field of "environmental chemodynamics". (Author abstract by permission)

75-0807. Burns, I. G.; Hayes, H. B. (Nat. Vegetable Res. Sta., Wellesbourne, Warwickshire, England). **Some physico-chemical principles involved in the adsorption of** the organic cation paraquat **by soil humic materials.** *Residue Rev. 52: 117-146; 1974.* (80 references)

Various physicochemical effects which are important in the adsorption of organic ions by soil organic matter are briefly reviewed and discussed. The topics covered include the nature and the origins of the adsorption forces, the influence of the Donnan potential on adsorption, the effects of particle and of film diffusion control on the rates of adsorption, and the importance of selectivity and of molecular complexity of the adsorbent in determining the exchange equilibrium. Special emphasis has been given to aspects which apply to the adsorption of the paraquat ion onto the weakly acidic exchange sites of soil organic matter. (Author abstract by permission)

75-0808. Takahashi, R.; Hayashi, M.; Kamata, T.; Takahashi, S.; Ishide, N.; Takahashi, M.; Takahashi, K.; Sugaya, H.; Hario, K.; Ito, S. (Second Ward of Internal Med., Hiraga Gen. Hosp., Aomori, Japan). **[A case suggestive of toxic hepatitis.]** *Akita-Ken Noson Igakkai Zasshi (Akita J. Rural Med.) 21(1): 82-83; 1974.* (Japanese)

A 44-year-old Agricultural Experiment Station engineer with a long history of organophosphorus insecticide application was hospitalized complaining of jaundice, pain in right hypochondriac region, and general malaise. Findings upon hospitalization were palpable liver (two fingers); eruptions of papules, pustules, and acne on the skin; and visible precipitation of brown pigment in the iris and bulbar conjunctiva, with turbid ocular conjuctiva. His liver function was represented by an icterus index of 17.5, Takeda reaction (+), thymol turbidity test (++), alkaline phosphatase 4.01, GOT 275 units, GPT 335 units, and cephalin-cholesterol flocculation (+++). His plasma ChE showed 0.37 ΔpH. The case seemed to involve toxic hepatitis due to pesticide contact based on the dermal and ophthalmological symptoms. The patient remained hospitalized with an early stage of liver cirrhosis. (A lecture presented at the 37th Annu. Meeting Akita Prefect. Soc. Rural Med., July 30, 1972, Akita, Japan.)

75-0809. Sugaya, H. (Study Group of Agr. Chem. Intoxication, Akita Prefect. Rural Med. Soc., Akita, Japan). **[Survey of the status of agricultural chemicals intoxication, especially the results of medical examination on Cooperative Application Group, 1971.]** *Akita-Ken Noson Igakkai Zasshi (Akita J. Rural Med.) 21(1): 83; 1974.* (Japanese)

During an Akita Prefectural survey of 6,000 persons in 1968, 18.5% answered that they were injured by application of pesticides, and according to the Prefectural survey in April 1971, the percentage of injured persons during one month in 1970 was 24.5. Further, according to the health survey calendar, the morbidity in 1971 was 35.7% and the frequency of morbidity was 29.3%, a little lower than in 1968. Because of the slight decrease of frequency, it is thought that the kinds of pesticides changed, decreasing the chance of general intoxication, while topical injury increased, and some people were injured several times.

75-0810. Popendorf, W. J.; Spear, R. C. (Environ. Health Sci., Sch. Pub. Health, Univ. California, Berkeley, CA 94720). **Preliminary survey of factors affecting the exposure of harvesters to pesticide residues.** *Am. Ind. Hyg. Ass. J. 35(6): 374-380; 1974.* (4 references)

A survey was conducted in the Central Valley of California among harvesters of grapes, oranges, and peaches. A comparison was made among factors which might affect their exposure to pesticide residues, such as the age and sex distribution of work crews, their apparel and work practices as related to foliar contact, and exposure to airborne particulates. Recurring high values of airborne particulates suggest that contaminated dust is the primary vehicle for residue exposure. (Author abstract by permission)

75-0811. Gehlback, S. H.; Williams, W. A. (North Carolina Div. Health Serv., Raleigh, NC 27602). **Pesticide containers: their contribution to poisoning.** *Arch. Environ. Health 30(1): 49-50; 1975.* (3 references)

Pesticide containers play an important role in the epidemiology of pesticide poisonings. Investigations of short-term exposures have shown that difficulty in disposal of used containers, inappropriate pesticide packaging, and lack of safety containers for household products contribute to morbidity. Remedies for some of the container-associated hazards could be achieved under existing laws. (Author abstract by permission)

75-0812. Stobbe, H.; Stieglitz, R. (Abteilung fuer Haematol., Humboldt-Univ., Berlin, DDR). **Grundsaetzliches zur Problematik berufsbedingter Leukosen. [Fundamental remarks on the problem of occupationally caused leukemias.]** *Arch. Geschwulstforsch. 44(1): 11-15; 1974.* (8 references) (German)

Etiological factors involved in the genesis of preleukemic states and occupational leukemia, and outlines of the mechanism of action of leukemogenic agents are reviewed. Drugs and chemicals causing aplastic anemia (pamyelophthisis) include such preparations as chloramphenicol, acetolamides, methylphenylhydantoin, phenylbutazone, gold preparations, thyrostatic drugs, and benzene as well as pesticides such as organochlorine compounds (DDT, lindane), and organophosphorus compounds in inhalatory or cutaneous exposure. Exogenous leukemogenic agents such as pesticides are considered to be contibutory etiological factors which activate a latent leukemia virus in the corresponding cells.

75-0813. Konetzke, G. W. (Zentralinst. fuer Arbeitsmed. der DDR, Berlin, DDR). **Die kanzerogene Wirkung von Arsen und Nickel. [The carcinogenic action of arsenic and nickel.]** *Arch. Geschwulstforsch. 44(1): 16-22; 1974.* (54 references) (German)

Epidemiological data on the carcinogenicity of arsenic and nickel and their compounds is reviewed. The carcinogenicity of arsenic, especially of its trivalent and pentavalent inorganic compounds, has been clearly demonstrated by 312 cases of lung cancer and 550 cases of skin cancer known from the literature. Hazards of exposure to arsenic exist in sulfuric acid production, smelting operations, in the production of arsenic dyes, and in the production and application of arseniferous pesticides in agriculture, forestry, and viticulture. In all German-speaking countries, 105 cases of lung cancer, including 17 cases of skin cancer, 3 cases of carcinoma

of the larynx, and 2 cases of carcinoma of the nose and nasal sinuses were found among wine-growers. Preferred target organs of arsenic are skin, lungs, and the upper respiratory tract. Both the periods of exposure and the latency periods are prolonged, the latter ranging from 3 to 45 years, averaging 25 years. Multicentric tumor growth is relatively common. The arsenic-induced tumors are partly flattened epithelium carcinomas, and partly round-cell carcinomas with a few adenocarcinomas. Arsenic-induced hyperkeratosis and melanoses are regarded as precanceroses, and reversible as such. Perforation of the nasal septum, laryngitis, bronchitis, polyneuritis, and arteriitis are the rather unspecific symptoms of exposure to arsenic.

75-0814. Stuart, E. (Nat. Swedish Board Occup. Safety and Health, Stockholm, Sweden). **Protective measures concerning the use of pesticides.** *Arh. Hig. Rada Toksikol. 24: 267-273; 1973.*

If the user observes certain safety rules, the risks inherent in the application of pesticides are diminished. The user must be educated. The farmer and forester must know exactly which kind of pesticides to use to kill weeds, insects, and fungi and how this is to be safely accomplished. To purchase the more poisonous pesticides in Sweden, the potential user must first obtain permission from the National Board of Agriculture. This requires attending a 3-day course and taking an examination in the proper use and risks involved. Advisory services and current information on pesticides must be continuously available to the users. Scientific meetings and journals are helpful in this regard. Clear regulations for proper handling and application must be on all containers of the pesticide. The equipment used, including the personal protection outfit, must be carefully maintained in good working order. Alternatives to the use of pesticides such as a biodynamic culture or biological control must be considered. A research project concerning the use of pesticides in Sweden has been started by the National Board of Occupational Safety and Health with focus on 4 aspects: attendance, testing, enquiry, and medical aspects.

75-0815. Kolmodin-Hedman, B. (Dept. Occup. Health, Nat. Board Occup. Health, Stockholm, Sweden). **Changes in drug metabolism and lipoproteins in workers occupationally exposed to DDT and lindane.** *Arh. Hig. Rada Toksikol. 24: 289-296; 1973.* (15 references)

Twenty-six Swedish male workers involved with the commercial application of insecticides were studied. Most were exposed to a mixture of DDT, chlordane, and lindane; some were also exposed to organophosphates. The compounds were applied weekly or daily as aerosols and mists with the principal solvent kerosene. Exposure through skin and by inhalation was possible. The plasma half-life in workers exposed to chlorinated pesticides was 7.7 hr as opposed to 13.7 hr in controls. Twenty-two men occupationally exposed mainly to lindane and DDT and 19 healthy persons were studied with regard to their fasting serum lipid levels and to the amounts of lipids in the 3 ultracentrifugally separated lipoprotein families, VLDL, LDL, and HDL. Eight of the exposed subjects and none of the controls had hyper-HDL(a)-lipoproteinemia. Plasma levels of lindane and DDT derivatives as determined with a new gas chromatographic method in 42 spraymen exposed to lindane and in 23 nursery workers with a low and intermittent exposure to DDT were significantly higher than controls with regard to lindane content.

75-0816. Kalic Filipovic, D.; Dodic, S.; Savic, S.; Prodanovic, M.; Arsenijevic, M.; Guconic, M.; Vidakovic, A. (Inst. Occup. Health and Radiol. Protect., S.R. Serbia, Belgrade, Yugoslavia). **Occupational health hazards in the production and application of pesticides.** *Arh. Hig. Rada Toksikol. 24: 333-339; 1973.*

The working conditions and health status of industrial workers exposed to organochlorine compounds, carbamates, organophosphates, organic mercurials, and lead arsenate have been studied. Gravimetric measurement of lindane and DDT dust samples revealed concentrations 2-3 times higher than permitted. Chemical analysis discovered higher concentrations of lindane and DDT. During lead arsenate production, arsenic and lead were above permissible concentrations. Excessive levels of organophosphorus compounds were also noted. A three year study was made of a group of 150 workers, 79% male and 21% female, who had been exposed to various pesticides for 6-10 yr. Severe intoxication was not detected. Some signs and symptoms of mild intoxication with lead arsenate were noted in 3.1% of the workers. The asthenovegetative syndrome was found in 18.75%. Stomach and intestinal diseases were seen in 14%, and a certain correlation could be drawn between such disease and length of exposure. Chronic conjunctivitis and pharyngitis occurred in 26%. A slight anemia of normochromic type was noted in 29.6%. The number of reticulocytes decreased to under 0.5% in 40.6% of the workers, and that of stippled cells increased in 6.2% of the workers to above 350/ million erythrocytes. Some liver function tests were slightly disturbed in 46.8%. An increase in arsenic in urine was noted in 25.0%, increased lead in 26.5%, and increased coproporphyrin in 25.5%. During the production of organophosphorus pesticides, a decrease in cholinesterase activity in blood was noted in 17.72% during the last months of exposure. A combined action of arsenic, lead, organic solvents, and organochlorine compounds was probably responsible for the toxic action noted in the bone marrow. A diminution of color vision was noted in 38.8%, and diminution of accomodation to dark in 25.5%. A description is also given of 10 women, aged 15-20 yr, suffering from intoxication due to exposure to the organochlorine and organophosphorus insecticides, endosulfan, trichlorfon,

and dichlorvos, occurring while they were seasonally employed on a large farm.

75-0817. Vojvodic, V. B. (Dept. Pharmacol. Toxicol., Inst. Technical Med. Protect., Belgrade, Yugoslavia). **Clinical picture, diagnosis and treatment of poisoning by organophosphate insecticides.** *Arh. Hig. Rada Toksikol. 24: 341-355; 1973.* (52 references)

General principles of organophosphorous insecticide poisoning in humans have been reviewed in this paper. Possible ways of poisoning are discussed, including occupational, accidental, suicidal, and homicidal. The chemistry of organophosphates is studied and various compounds are grouped according to their chemical structures. The physiology and pharmacology of organophosphorous poisoning is presented, including a listing of signs and symptoms of acute poisoning. Specific consideration is given to diagnosis and treatment of poison cases. Attention is also given to specific signs of poisoning, cholinesterase activity, and oxime therapy.

75-0818. Sundell, L.; Rehn, M.; Axelson, O. (Dept. Occupational Med., Regional Hosp., Orebro, Sweden). **An epidemiological study concerning herbicides.** *Arh. Hig. Rada Toksikol. 24: 375-380; 1973.* (20 references)

A retrospective epidemiological study was made of all Swedish railway workers exposed to herbicides during the years 1957 to 1971. Only workers exposed for more than 46 days were included in the study. A total of 324 workers were examined, of whom 143 had been exposed mainly to amitrole and combinations, 194 to phenoxyacetic acids and combinations, and 28 to other herbicides and combinations including amitrole. During the years 1957 to 1961 about 45-50 tons of herbicides were used each year. The observed and expected total deaths, tumor deaths, and lung cancer death rates during the years 1967-1962 were compared in the 4 different groups. A significant difference was found at a 5% level for lung cancer in the amitrole group. Two excess lung cancer cases were noted, 1 adenocarcinoma and 1 oatcell cancer. Although the number of subjects was small, especially the number of cancers, the possibility that amitrole and combinations together with smoking might have caused the excess lung cancers cannot be ruled out.

75-0819. Weissglas, G. (Swedish Nat. Board Occup. Health and Safety, Stockholm, Sweden). **Swedish legislation on pesticides.** *Arh. Hig. Rada Toksikol. 24: 405-410; 1973.*

Central legislation in the field of environmental protection in Sweden is found in the Environment Protection Act, which came into force July 1, 1969. The Public Health Act, Poisonous Substance Ordinance, and Pesticide Ordinance enable authorities to restrict the use of substances dangerous to the environment or to prohibit their use if necessary. Certain organic mercury compounds, phenoxy acids, aldrin, dieldrin, DDT, lindane, polychlorinated biphenyls, and aminotriazole are thus restricted or prohibited. A Royal commission has been established to investigate the extent to which legislation concerning the control of products harmful to the environment should be expanded. A brief sketch of the different administrational bodies responsible for questions of environmental safety is given. One of these agencies, the Poisons and Pesticide Board, registers pesticides and controls the use of these and other substances which are toxic or injurious to health. A pesticide cannot be registered if it is so poisonous as to damage man, domestic animals, wild life, beneficial insects, and domestic plants. A pesticide may be sold only in its orginal container which must carry a label or warning, along with the name and quantity of active ingredients and nonactive ingredients if dangerous to human health. Pesticides are placed into 1 of 3 classifications depending on the danger of the substance. There are special regulations for pesticides which are poisonous to pollinating insects.

75-0820. Saha, J. G.; Burrage, R. H.; Lee, Y. W.; Saha, M.; Summer, A. K. (Chem. and Biol. Res. Inst., Res. Branch, Agr. Canada, Ottawa, Ontario, Canada). **Insecticide residue in soil, potatoes, carrots, beets, rutabagas, wheat plants and grain following treatment of the soil with Dyfonate.** *Can. J. Plant Sci. 54(4): 717-723; 1974.* (11 references)

Dyfonate (*O*-ethyl *S*-phenyl ethylphosphonodithioate) was incorporated into soil at the rate of 5.6 or 11.2 kg/ha as granules or emulsifiable concentrate and its persistence in soil and its absorption by potatoes (*Solanum tuberosum* L.) carrots (*Daucus carota* L.), beets (*Beta vulgaris* L.), rutabagas (*Brassica napobrassica* (L.) Mill), and wheat (*Triticum aestivum* L.) plants were studied in four locations in Saskatchewan. Proportionately more residue persisted in the soil from the higher rate of application. About 33-35% of the Dyfonate applied as granules at the lower rate remained in the soil 4 mo after application, whereas about 38-41% remained from the emulsifiable concentrate. At the end of the same period, 52-64% of the granules applied at the higher rate remained in the soil as compared to 50-71% from the emulsifable concentrate. Only 3-10% of the applied chemical remained in the soil 29 mo after application. No residue of dyfoxon (*O*-ethyl *S*-phenyl ethylphosphonothioate) was detected in any soil. Potatoes, beets and rutabagas harvested 4 mo after application of Dyfonate had little (0.005 to 0.009 ppm) or no detectable (less than 0.005 ppm) residue, irrespective of the rate of application. Wheat seedlings had between 0.01-0.07 ppm Dyfonate and little or no detectable residue in the more mature plant or in the grain. Carrots grown in soil treated at the lower rate had about 0.35 and 0.04 ppm Dyfonate and dyfoxon, respectively, and at the higher rate, 0.81 and 0.06 ppm.

About 77-94% of the residue in carrots could be removed by peeling. (Author abstract by permission)

75-0821. Winek, C. L.; Collom, W. D.; Fusia, E. P. (Toxicol. Dept., Allegheny Coroner's Office, Pittsburgh, PA). **Yellow phosphorus ingestion—three fatal poisonings.** *Clin. Toxicol. 6(4): 541-545; 1973.* (8 references)

At present, most acute yellow phosphorus poisonings result from ingestion of rat or roach poisons containing 1-4% yellow phosphorus as the active ingredient. The aim of treatment is to eliminate the phosphorus before it is absorbed. Lavage and purge are standard procedures. When doses in excess of 1 gm are consumed, survival is unlikely. These doses lead to peripheral vascular collapse and death. A lavage of potassium permanganate 1:1000 strength is followed by mineral oil cathartic to prevent further absorption. Diagnosis is difficult. A person who has attempted suicide and who has gastrointestinal pain or upset should be suspect. Luminous feces or vomitus strongly suggests phosphorous poisoning. Three deaths, one accidental and 2 suicidal, resulting from ingestion of a rat poison paste containing 3% yellow phosphorus as the active ingredient are reported. Case 1 was a 22 month old black male. Although the hospital to which he was admitted had an excellent poison control center, the nurse and doctor in attendance chose not to consult this source of information. The child died for lack of proper treatment. Case 2, a 63 yr old black female, did not receive proper treatment due to lack of information as to the active ingredient in the poison. Case 3, a 43 yr old black male, exhibited the 3 classic stages of phosphorus poisoning yet no action was taken during the first two stages at which time his life might have been saved. The following conclusions are drawn. If a poison control center is available, it should be consulted. The advice from such a center can only be as accurate as the information in it. It cannot be assumed that all poisons manufactured to attack a given pest contain the same active ingredient. When case 3 was finally treated, it was assumed the poison had coumadin as its active ingredient, not yellow phosphorus.

75-0822. Huguet, M.; Malby, M. (Author address not given). **Les pesticides organo-phosphores en arboriculture fruitiere dans l'Herault et leurs effets biologiques chez l'homme utilisant ces produits. [Phosphorus-containing pesticides in fruit arboriculture in Herault and their biological effects in persons utilizing these products.]** *Evol. Med. 17(3): 229-235; 1973.* (French)

The biological effects of organophosphorus pesticides on subjects exposed during application in orchards and vineyards in the Herault region in France were surveyed. The pesticides used most commonly were azinphosethyl, azinphosmethyl, parathion, and methyl-parathion. A survey conducted among 150 persons distributing such products in orchards revealed vertigo and headache in 18 cases, nausea in 18 cases, loss of appetite in 20 cases, and abdominal pains in 4 cases. In certain cases these symptoms may have been due to the offensive odor rather than to poisoning. Systematic cholinesterase tests revealed an overall reduction of the enzyme activity in subjects exposed to organophosphorus compounds during the vegetation period, and significant reduction during the latter as compared with the period before and after the period when the pesticides were applied. The findings indicate failure to comply with safety regulations, especially regarding the use of protective clothing and gloves. It was not always possible to establish a close correlation between the reduction in red cell cholinesterase activity and the clinical symptoms of the poisoning.

75-0823. Serat, W. F.; Bailey, J. B. (Community Studies on Pesticides, State Dept. Health, Berkeley, CA 94704). **Estimating the relative toxicological potential of each pesticide in a mixture of residues on foliage.** *Bull. Environ. Contam. Toxicol. 12(6): 682-686; 1974.* (3 references)

In August and September 1970, 51 acres of Thompson seedless grapes near Fresno, California were treated with ethion (1.6 lbs/acre) and guthion (azinphosmethyl, 1.9 lbs/acre), zolone (phosalone, 3.0 lbs/acre), and dibrom (naled, 1.0 lbs/acre). Leaf samples were taken before and at varying intervals after the pesticide applications to determine the rate of disappearance of the residues. Workers entering the vineyards to harvest the grapes in October were monitored for changes in blood cholinesterase levels relative to levels determined before entering the field. This procedure was repeated 2 and 4 days later. Values of the toxicologic potential for guthion, zolone, and ethion were calculated with an assumption that they are mutally potentiating at factors of 1.5-fold each. At the time the fields were entered, the toxicologic potentials of ethion, guthion, and zolone were 0.0053, 0.0467, and 0.0885, respectively. For this combination, guthion showed a toxicologic potential of 9-fold relative to ethion and zolone showed a toxicologic potential of 17-fold relative to ethion. In toxicologic potential, zolone would probably compare with guthion at comparable residue age. Ethion, per se, appeared to offer little if any contribution to the cholinesterase decreases observed in the workers.

75-0824. England, D. C. (Dept. Animal Sci., Oregon State Univ., Corvallis, OR 97331). **Husbandry components in prenatal and perinatal development in swine.** *J. Anim. Sci. 35(5): 1045-1049; 1974.* (42 references)

The husbandry components in animal development include all of the conditions that influence the duration and quality of survival. Biological data from the literature indicates that healthy pigs which are undersized at birth are equal to their littermates in production capacities. Dedication and consistent perseverance are

required at farrowing and during the early postnatal period for maximum survival. The use of dichlorvos in later gestation to increase birth weight and/or survival was investigated. Conflicting results have been obtained regarding the effects on birth weight, and there is some indication that strength or vigor may be increased by dichlorvos treatment without increasing birth weight. The liver glycogen levels were high and the weight gains from birth to 72 hours were lower in piglets from sows fed dichlorvos.

75-0825. Weil, T. A.; Weil, B. Q.; Blaustein, B. D. (Univ. Chicago, Chicago, IL 60637). **Chemistry for nonscientists: the case of DDT.** *J. Chem. Educ. 51(3): 198-199; 1974.* (33 references)

The case of DDT offers an excellent illustration of the complex interactions between technology and society, and can form the basis fot a pedagogic presentation of interest even to nonscience students. Since its first preparation in 1874, DDT has proven effective in controlling typhus and malaria. There has also been a good correlation between pesticide usage and agricultural yield, although the use of very large amounts of DDT, as in the U.S., is not necessarily correlated with correspondingly high yields. DDT resists chemical breakdown and has been found practically everywhere and in everything. Since it is concentrated in fatty tissues of living creatures, its concentration increases among species higher on the food chain. Reductions in reproduction and declining populations among flesh-eating birds have been attributed to high DDT concentrations. Over 200 species of insects throughout the world are resistant to insecticides, including 38 species of malaria-carrying mosquitoes. Warnings of possible adverse effects of DDT on various organisms began appearing as early as 1945, but until recently were largely ignored. The use of DDT has been largely or entirely banned in many countries, including the US, Denmark, New Zealand, Sweden, the USSR, and Germany. However, since they have no other practical, economic alternatives, many underdeveloped countries must continuse to use DDT. Other means of controlling insects and diseases must be found.

75-0826. Markkula, M. (Agr. Res. Cent., Dept. Pest Invest. Tikkurila, Finland). **Pesticide regulation in Finland.** *Kemia Kemi 1(9): 630-635; 1974.*

In 1969 the Pesticide Act was extended to include chemicals used in forest protection, aquatic weed destruction, insect repulsion, and plant growth regulation. The Pesticide Regulation Unit. composed of the Departments of Plant Husbandry, Plant Pathology, Horticulture, and the Pest Investigation of the Agricultural Research Center, governs implementation of the Pesticide Act. The efficiency of a new product must be determined, its chemical composition and residues investigated, and its harmful effects to cultivated plants, soil, and nature ascertained. The product will be declared a toxic or a mildly toxic pesticide based on its risks to human health. Only after the Ministry of Social Affairs and Health acts favorably can the Pesticide Regulation Unit grant a sales license. The above procedure must be followed for all pesticides containing poisons listed in the legislation on poisons. Other pesticides may be licensed for sale without any decision from the Ministry of Social Affairs and Health. A sales license is issued for 5 yr after which time reapplication is necessary. A license may be cancelled if use of the pesticide proves harmful. The extent to which pesticides are used in Finland is discussed and lists of safety intervals for pesticides and their tolerances in foodstuffs are provided.

75-0827. Axelson, O.; Rehn, M.; Sundell, L. (Clin. Occup. Dis., Regional Hosp., Orebro, Sweden). **Exposition for herbicider—mortalitet och tumorincidens. En epidemiologisk undersokning av svenska jarnvagsarbetare. [Exposure to herbicides—mortality and tumor incidence. An epidemiologic investigation of Swedish railroad workers.]** *Laekartidningen 71(24): 2466-2470; 1974.* (12 references) (Swedish)

An epidemiological survey was conducted among Swedish railroad workers occupationally exposed to herbicides, such as phenoxyacetic acid and their analogs, amitrole, and other herbicides for 1 to over 90 days in a 5-year period to determine the cancer mortality. While the tumor incidence and mortality in a group exposed to phenoxyacetic acid type herbicides was nearly the same as in a control group, dose-related significant increase in the tumor incidence and mortality was observed in another group exposed to amitrole. These findings are in agreement with results of animals tests concerning the carcinogenicity of amitrole. The tumors in the amitrole-exposed group were localized in the lips, neck, maxillae, prostate, lungs, bladder, pancreas, and cerebrum. Cancer epipharyngis, reticular-cell sarcoma, and chronic lymphatic leukemia were also observed.

75-0828. Anonymous. **The paraquat puzzle.** *Med. J. Aust. 2(22): 800-801; 1974.*

After paraquat poisoning, the interval between ingestion and death, the ultimate cause of death, and the absorption and excretion rates are all variable, as is the lethal dose in humans. The mortality rate from accidental ingestion is 35-50% in adults and lower in children; the mortality rate in cases of attempted suicide is much higher. The granular form is seldom fatal; the 20% aqueous corrosive form is often fatal. Systemic poisoning does not occur in those using parquat occupationally. Small doses of the herbicide can be fed to animals for prolonged periods without adverse effects. It is poorly absorbed, but the toxic effects are prolonged. Although paraquat causes proliferation of fibroblasts, no carcinogenic action has been demonstrated. Taken

orally, it causes ulceration in the digestive tract, diarrhea and vomiting, renal damage, jaundice, and variable effects on the heart. The most striking and serious effect is on the lung, where the pesticide causes edema, hemorrhage, and fibrosis. Death from anoxia is common. The treatment of paraquat poisoning is directed towards elimination of the material from the body.

75-0829. Lewis, T. D. (Dept. Med., McMaster Univ., Hamilton, Ontario L8S 4J9, Canada). **Paraquat overdose.** *Med. J. Aust. 2(22): 814-815; 1974.* (10 references)

A 25-year-old woman weighing approximately 60 kg swallowed nearly 100 gm of Weedex (containing nearly 1.8 gm of parauqat in the granular form) dissolved in water along with 60 capsules containing salicylamide and bromide. She vomited soon after and gastric lavage was performed 1 hour later. Treatment with bentonite, subbentonite, prednisolone, and ampicillin was begun. Rapid i.v. fluid infusion and i.v. diuretic administration were begun 8 hours after the paraquat was consumed. Rapid fluid infusion was discontinued after three days and the diuretics were discontinued 2 days later. The patient remained alert throughout and was discharged after 14 days with no pulmonary abnormality or edema. Laboratory findings showed paraquat in the urine on the evening after ingestion and further indicated a restrictive ventilatory defect which had disappeared by the 15th day.

75-0830. Ghachem, A.; Hassen, M. (Author address not given). **Des circonstances d'observation des intoxications aigues par le parathione en Tunisie. [Observed incidences of acute parathion poisoning in Tunisia.]** *Med. Leg. Dommage Corpor. 6: 365-365; 1973.* (French)

Sociological circumstances and symptoms of acute poisonings by parathion in Tunisia are described. Acute poisonings by parathion in Tunisia account for 63% of the 506 poisonings with chemicals, which is due to the easy availability and low price of the insecticide. Most cases are due to suicide, especially in females, but accidental poisoning, e.g., by skin application, may also occur. Fatal poisoning was reported in a farm worker who dusted with parathion without wearing a shirt in hot weather. Headache, diarrhea, emesis, abdominal pains, profuse perspiration, and dyspnea leading to cyanosis, convulsions, and coma were observed in children following accidental ingestion of parathion. Miosis, congestion of the lungs, generalized alveolar edema, congestion of the liver possibly with steatosis, and pink mucus in the upper respiratory tract are characteristic of poisonings with parathion.

75-0831. Anonymous. **How paraquat gets into the lung.** *New Sci. 64(927): 797; 1974.*

Paraquat, a widely used bipyridyl herbicide, causes severe lung damage leading to death days or even weeks after it has been swallowed. It has been suggested that paraquat is accumulated in the lung via an energy-dependent mechanism which acts like a pump to remove paraquat from the blood plasma and store it in the lung. Once paraquat gets to the lung, the way in which it is retained is still unknown, although this also appears to be energy dependent. The major gross effect on the lung is scar formation which causes the lung to lose its respiratory efficiency. Paraquat uptake in lung slices has been inhibited by the addition to the medium of iodoacetate and potassium cyanide (preventing glycolysis and pyruvate metabolism, respectively), or by the addition of rotenone, the specific inhibitor of mitochondrial respiration. Thus, the uptake of paraquat by the lung depends on the lung's ability to manufacture ATP. Following paraquat administration, rats were given a saline stomach wash, followed by doses of castor oil, magnesium sulfate, and bentonite, all designed to prevent the absorption of paraquat into the plasma. The rats were treated between 4 and 10 hr after herbicide administration and an 80% recovery rate was achieved at each time interval. This may be useful in cases of human paraquat poisoning. Hemoperfusion and hemdoialysis, as methods which act directly to reduce plasma paraquat concentrations, may also prove useful.

75-0832. Anonymous. **Safety of Vapona again in doubt.** *New Sci. 65(1): 3; 1975.*

Dichlorvos, found on resin-strip formulations, depends for its effectiveness on permanently saturating the household atmosphere with concentrations of the insecticide high enough to kill insects. Whether such a vapor, toxic to insects, can be totally harmless to man is the question currently being raised. Possible genotoxic properties are being considered, following the discovery that the chemical can alkylate DNA in vitro. Dichlorvos was found to be genotoxic in mice, but to the extent of 10 to 100 times more than other methylating agents such as dimethyl sulfate. Evidence has also been obtained of a low level of mutagenicity by dichlorvos in vivo. However, experiments with dimethyl sulfate have demonstrated that only a small dose-dependence exists for mutagenic effects. Therefore, even the relatively low genotoxicity of dichlorvos may be causing mutations in people domestically exposed to vapona and mafu strips.

75-0833. Munch, B.; Clausen, B.; Karlog, O. (Royal Veterinary Agr. Univ., Copenhagen, Denmark). **Thallium poisoning in red foxes (*Vulpes vulpes*) and badgers (*Meles meles*) in Denmark.** *Nord. Veterinaermed. 26: 323-338; 1974.* (9 references)

The Danish Toxicological Boards' list of classified pesticides (1973) includes a total of 59 preparations containing thallium sulfate. Approximately one ton of thallium sulfate is sold each year. The present study recounts cases of thallium poisoning among 48 red foxes and 5 badgers examined over the years 1963-1970, and

from 34 foxes examined during 1971. All the animals were free-living and were taken for examination because they were either dead or diseased. Polarographic, spectrophotometric, and atomic absorption spectrophotometric determinations were made. In many of the thallium poisoned foxes, clinical data as well as autopsy findings were similar to what may be seen in cases of affection of the central nervous system and/or gastrointestinal tract, as caused by certain bacterial and viral infections, parasitic infestations, or other poisonings. It is noted that remains of food were not found in the stomach of any foxes with thallium poisoning. Vomiting and anorexia may therefore be accompanying symptoms in thallium poisoning in foxes. Anamnestic data and the presence of partly-digested mice in the stomach of a badger suggests an indirect uptake of thallium. Direct or indirect uptake cannot be specified for the foxes. Results of this study emphasize the desirability of replacing rodenticides containing thallium with substances which entail less risk to the other wild fauna as well as domestic animals.

75-0834. Clausen, B.; Karlog, O. (Royal Vet. Agr. Univ., Copenhagen, Denmark). **Loading with thallium among wild animals of the marten genus and badgers in Denmark.** *Nord. Veterinaermed. 26: 339-350; 1974.* (10 references)

A systematic examination of wild martens and badgers (60 animals in all) over a 2-yr period revealed a thallium load in 48% of the animals, while at least 22% were actually poisoned. No skin lesions were noted as had been found in foxes, perhaps because in martens the majority of cases of poisoning have a more acute course than in foxes. The empty stomach, another characteristic of foxes, was not noted in martens. The majority of cases of poisoning were seen in well-nourished animals with acute hemorrhagic inflammation of the intestines. Evidence indicated that martens may also be exposed to a secondary risk of poisoning. The poisoning was slow developing, as has been noted in other animals. The frequency of the poisonings is viewed as alarming. The development of warfarin-resistant rats in Bjerre Herred, south of Horsens, has caused an increase in the use of thallium, and a relatively large number of the thallium-poisoned or loaded animals (14%) were received from that district. These findings clearly demonstrate the urgent need to restrict use of thallium-containing rodenticides.

75-0835. Barnes, J. M. (Med. Res. Council Toxicol. Unit, MRC Labs., Carshalton, Surrey, England). **Toxicology of agricultural chemicals.** *Pesticides 8(2): 19-24; 1974.* (16 references)

There is no evidence that any environmental contamination due to the use of pesticides has been followed by any change in the incidence of human disease or disability. Among agricultural workers, serious intoxication from pesticides is neither significant nor increasing, and death due to occupational exposure to pesticides has been virtually or totally nonexistent in recent years. Real hazards due to residues in food are apparently also nonexistent except in the case of the consumption of pesticide-treated seed grain; efforts to cope with the latter problem have been lacking. The accidental contamination of food supplies during transportation has also received inadequate consideration despite the fact that it poses risks for those who consume the food. Neither international agencies nor private and public enterprise has encouraged the development of less dangerous pesticides nor prevented the sale of more toxic compounds for which less toxic substitutes are available. More alarm has been raised over the comparatively less toxic but more persistent pesticides such as DDT than the more toxic and less persistent compounds such as parathion. Studies are needed to determine the safety of pesticides under practical conditions. Some restraint should be exercised in the application of persistent compounds and the use of more desirable alternatives encouraged. As a class, good pesticides are not unusually toxic to mammals, nor do they pose a treat to those who handle them properly. Damage from pesticides generally follows the irresponsible disregard of safety precautions by users.

75-0836. Kazantzis, G. (Dept. Community Med., Middlesex Hosp. Med. Sch., London, England). **Food contaminants.** *Postgrad. Med. J. 50(588): 625-628; 1974.* (7 references)

With increased use of chemicals, the opportunity for the contamination of food is becoming greater. Food may be contaminated accidentally or from general environmental contamination. Three examples are given. The hospitalization of 700 people in Morocco in 1959 was traced to cooling oil which contained a mineral oil, triorthocresylphosphate, a known nerve poison. An epidemic of jaundice involving 84 people in Essex was caused by the contamination of flour by 4,4′-diaminodiphenylmethane, a hardener for epoxy resin, which was spilled on the floor of the van used for the delivery of both products on the same day. In autumn 1971, 80,000 tons of mercury-dressed wheat and barley arrived in a middle-eastern country for sowing as part of a large scale agricultural program. The shipment arrived in late autumn and many peasant farmers had already planted their summer harvest, expecting that more seed was to come. Some of the dressed seed was ground into flour in village mills and made into bread. Warnings in English and Spanish on the sacks were of no use to the Arab population. Over 6000 were hospitalized and a proportion of the survivors have permanent neurological damage. More work is needed on an international level concerning contaminants in food including education and appropriate legislation.

75-0837. Illingworth, C. M. (Children's Hosp., Sheffield, England). **Childhood poisonings. Who is to blame?** *Practitioner 213(1273): 73-78; 1974.* (6 references)

During a 12 month period, 622 children were hospitalized for poisoning. Although the largest group of offending substances ingested were drugs, including aspirin, some of the cases resulted from the ingestion of insecticides, fungicides, and pesticides. A large number of these accidental poisonings could have been avoided, but no amount of care could have prevented all of them. The desire or ability of children to ingest some of the items that they did was unpredictable. A child watched all day would be overprotected and fail to gradually acquire independence. Without the taking of calculated risk, over-protection will lead to accident-proneness; if a small child who is normally inquisitive and determined to explore does not suffer accidents, the parents of that child must be good, careful parents, and lucky as well.

75-0838. Anonymous. **[Miscellaneous Records: Notice No. 55 of Environmental Agency, Sept. 9, 1974, on pesticide residue standards.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 15(6): 495-497; 1974.* (Japanese)

Pesticide residue standards were recently established in Japan for 15 pesticides: chlorthiamid, 0.05 ppm in rice and cereals; omite (propargite), 3.0 ppm in fruits and tea; phenthoate, 0.4, ppm in cereals, 0.1 ppm in fruits (except pear, peach, and citrus) and vegetables (except pumpkin), 0.05 ppm in potatoes and legumes, and 0.1 ppm in tea; chlorfenethol, 1.5 ppm in fruits, 0.5 ppm in vegetables, and 7.0 ppm in tea; chlorophenamidine (chlordimeform), 0.1 ppm in rice, 2.0 ppm in fruits, 0.6 ppm in vegetables and tea; endosulfan, 0.5 ppm in fruits, vegetables, potatoes, legumes, beets, and tea; tetradifon, 1.0 ppm in fruits (except citrus), vegetables, and tea, 3.0 ppm in citrus; naled 0.1 ppm in rice, fruits, vegetables, and tea; simazine, below detection limit in rice, cereals, fruits, vegetables, potatoes, legumes, and tea; triphenyltin hydroxide, triphenyl tin acetate, and triphenyl tin chloride, 0.1 ppm in potatoes and beets, and 0.02 ppm in legumes; disulfoton 0.1 ppm in rice, vegetables, potatoes, and legumes; and oxyethylene rape seed oil alcohol, 1.0 ppm in rice, fruits, and vegetables.

75-0839. Samosh, L. V. (All-Union Sci. Res. Inst. Hyg. Toxicol. Pesticides, Polymers, and Plastic Materials, USSR Min. Public Health, Kiev, USSR). **Khromosomnyye aberratsii i kharakter sputnichnykh assotsiatsiy pri sluchaynom vozdeystvii polikholorkamfena na organizm cheloveka. [Chromosome aberrations and the character of satellite associations following accidental exposure of the human body to polychlorocamphene.]** *Tsitol. Genet. 8: 24-27; 1974.* (12 references) (Russian)

Chromosomal aberrations and the character of satellite associations following acute poisoning by polychlorocamphene were studied in female farm workers. The poisoning was due to the premature start of work on fields previously sprayed with polychlorocamphene from aircraft at an application rate of 2 kg/ha. An increased number of aberrant cells (13.1% compared to 1.6% in the control group) and an increase in the average number of cells with associations (92.8% versus 84.5% in the control) were established. A tendency toward enhancement of associations with D chromosomes was observed.

75-0840. Arestov, I. G.; Antyukov, M. A. (Vitebsk Vet. Inst., Vitebsk, USSR). **Otravleniye zhivotnykh preparatami rtuti. [Poisoning of animals by mercurial preparations.]** *Veterinariya (Moscow) 11: 109-110; 1974.* (Russian)

Two cases of acute poisoning by organomercurial pesticides in cattle are reported. In one case, massive poisoning occurred among cattle following ingestion of grain accidentally treated with Granosan. Loss of appetite, depression, muscular tremor, atonia of the gastrointestinal tract, eczema, and sharply reduced milk production were observed. Histological investigations revealed yellow color of the mucosa, muscle, and intramuscular connective tissue, hemorrhagic gastroenteritis with ulceration of the intestines, focal subepicardiac hemorrhage, and hemorrhage in the kidneys and spleen. In another accident, several young cows died following skin application of a mercury-containing cream at an expenditure of 40 g per animal. Observed symptoms included motor coordination troubles, ulcerous stomatitis, hyperemia of the lungs, anemia and enlargement of the liver, hyperemia of the spleen, and slow-healing, bleeding wounds in the sites of application.

See also 75-0762 75-0768 75-0796 75-0898 75-0907

75-0841. Stieglitz, R.; Gibel, W.; Werner, W.; Stobbe, H. (Dept. Haematol., Med. Clin. I. and Inst. Pathol., Berlin, Germany). **Experimental study on haematotoxic and leukaemogenic effects of trichlorophone and dimethoate.** *Acta Haematol. 52(2): 70-76; 1974.* (5 references)

The hematological effects of the economically important alkylphosphates, trichlorfon and dimethoate, were tested experimentally on Wistar rats. The rats were treated twice weekly until spontaneous death with either trichlorofon (15 mg/kg i.m. or by tube) or dimethoate (5, 10, and 15 mg/kg by tube or 15 mg/kg i.m.). A pronounced hematotoxic action of these pesticidal organophosphate compounds was found, including severe hyperplasia of the hematopoietic parenchyma of bone marrow and extra-osseous myeloid metaplasia, particularly in liver and spleen. The changes in the hematopoietic systems of the rats should be associated with the myeloproliferative syndrome of which different morphological manifestations and hematological courses are known. Exclusive morphological differentiation of extra-osseous myeloid metaplasia with concomitant myeloproliferation and straightforward interpretation as leucosis may be problematic. The animals exhibited hyperplasia of all systems, although granulocytopoiesis was predominant in most cases which may be myeloid leucoses. The study indicates that hematological parameters should be included in regular routine checks of individuals handling such alkyl phosphates both in manufacturing industries and in agriculture. These findings may also be important in classifying patients with a history of exposure to such compounds.

75-0842. Yamane, S.; Kino, A.; Teshima, S. I. (Lab. Fish Physiol., Dept. Fisheries, Fac. Agr., Miyazaki Univ., Miyazaki, Japan). **Histochemical demonstration of cholinesterase activity in tissues of the carp and effect of DDVP on its activity in situ.** *Acta Histochem. Cytochem. 7(2): 167-174; 1974.* (17 references)

Adult laboratory-reared carp (*Cyprinus carpio*) were exposed to 25 ppm DDVP (dichlorvos) in their aquarium water for 45 minutes (24 TLm = 20 ppm). The cholinesterase activity of the optic lobes, cerebellum, medulla oblongata, retina, intestine, liver, kidneys, heart, and body muscle was then determined histochemically, and the results compared with those from tissues taken from unexposed fish. In the normal fish, intense cholinesterase activity was demonstrated in the stratum griseum periventriculare, granular layer of the cerebellum, inner plexiform layer of the retina, lamina propria and submucosa of the intestine, septum of the sublayers of the intestinal muscularis, Malphighian corpuscle of the kidney, ventricular wall of the heart, and sarcolemma of the body muscles. Moderate to weak activities were found in many other tissue layers. DDVP abolished the cholinesterase activity in many of the tissues examined, including the stratum griseum periventriculare, sarcolemma, and liver, and lowered the activity in all other tissues studied. Thus, DDVP interfered with various efferent neurons because of their cholinergic character.

75-0843. Paulov, S. (Dept. Gen. Zool. Anim. Physiol., Fac. Natur. Sci., Univ. J. A. Komensky, Bratislava, Czechoslovakia). **The effect of metation E-50 on serum and muscle proteins of ducks.** *Acta Vet. (Brno) 43(1): 33-35; 1974.* (11 references)

Two-day-old Peking White ducklings were sprayed with 5 ml of a 0.2% water solution of a commercial preparation of Metation E-50 (methyl parathion); the treatment was repeated after 5, 10, and 15 days. After the final treatment, the protein content in the blood and thigh muscle was determined, along with the keratin content in the feathers, using polyacrylamide gel electrophoresis. Compared with nontreated ducklings, the number of protein fractions in the blood was reduced from 18 to 8 in 50% of the treated birds; in the other treated birds, the level of components 3-13 was lowered by 30-40%. The values of the seventh and eighth muscle fractions were decreased to 25-30% in the experimental ducklings. The keratin spectrum of the feathers was unchanged, and there was no significant difference in weight between the control and experimental birds. The changes in the protein spectra of the treated ducklings probably reflected changes in the total metabolism.

75-0844. Anonymous. **The ingesta-dose technique.** *Agr. Res. 5: 12-13; 1974.*

In order to evaluate the safety of chemicals to which animals may be exposed and to establish safety precautions, regulatory agencies are aided by metabolism studies. Whether or not a chemical undergoes alteration or detoxification in the intestinal tract can significantly affect the potential hazard of residues subsequently found in meat and milk or returned to the environment. Many techniques which have been employed in metabolism studies do not simulate natural conditions under which animals may be exposed to hazardous chemicals. Natural exposure is more closely simulated by the donor-recipient ingesta exchange technique. This technique uses paired rats of similar breeding and age. One rat becomes a fed donor, the other a fasted recipient. The ingesta of the donor is recovered, uniformly mixed with the chemical dose, heated to 98°F, and orally administered to the recipient. Studies comparing this technique with other, more commonly used techniques, gave very different absorption rates for carbaryl. Concentrations of carbon-14 in portal blood were about 15 times lower after the ingesta-dose than after the micro-dose. Presence of ingesta in the stomach definitely slowed gastrointestinal absorption. The slower rate of absorption probably affected the degree of breakdown of carbaryl before and after absorption. It was not clearly determined whether carbaryl is chemically altered in the intestinal tract.

75-0845. Sides, P. J., Jr.; Wittels, B. (Duke Univ. Sch. Med., Durham, NC 27706). **2,2-Bis(*p*-chlorophenyl)-1,1,1-trichloroethane (DDT) as a potent inhibitor of toad bladder Na^+,K^+-ATPase.** *Am. J. Pathol. 78(1): 45a; 1975.*

Previous studies revealed that DDT, via depression of sodium transport, causes a gradual depression of the short-circuit current and potential difference as well as a moderate reduction in the transtissue resistance of the isolated toad bladder. DDT and many of its lipophilic analogs were found in the present study to be powerful inhibitors of Na^+,K^+-ATPase activity and moderate inhibitors of Mg^{++}-ATPase activity. DDA (hydrophilic) had little effect on either of these enzymes or on the isolated bladder. The median inhibitory doses of DDT (ID50) for the two enzymes were estimated at 4.37 μM for Na^+,K^+-ATPase and 0.35 mM for Mg^{++}-ATPase. Although DDT may injure the bladder in other ways, it clearly and directly inhibits the transport-associated Na^+,K^+-ATPase at very low concentrations. This finding serves to explain the morphologic changes of marked cellular swelling and subsequent disruption of cellular contents that occur after prolonged exposure of the bladder to DDT.

75-0846. Haines, J. R.; Alexander, M. (Dept. Agron., Cornell Univ., Ithaca, NY 14850). **Microbial degradation of high-molecular-weight alkanes.** *Appl. Microbiol. 28(6): 1084-1085; 1974.* (5 references)

Natural ecosystems receive diverse alkanes from pesticide formulations and other sources. Their biodegradation is of environmental importance. Degradability was assessed by measuring the biological oxygen demand. All of the compounds tested, heptane through tetratetracontane, were metabolized. An effect of the molecular weight on the rate of decomposition was apparent, with the oxygen uptake in the presence of tetracontane and tetratetracontane appreciable only at 20 days. Liquid from the biological oxygen demand bottles was inoculated into a hydrocarbon-inorganic salts medium to enrich for microorganisms capable of using docosane, dotriacontane, and hexatriacontane as carbon sources. Several bacteria were isolated from these enrichments. One was also able to grow at the expense of tetracontane and tetratetracontane. Thus, microorganisms have the capacity to destroy, in vitro, normal alkanes of higher molecular weight than had been believed. In view of the persistence in nature of polyethylenes, these findings assume great significance.

75-0847. Khan, H. M.; Khan, M. A. Q. (Dept. Biol. Sci., Univ. Illinois at Chicago Circle, Chicago, IL 60680). **Biological magnification of photodieldrin by food chain organisms.** *Arch. Environ. Contam. Toxicol. 2(4): 289-301; 1974.* (20 references)

Species differences were seen among fresh-water invertebrates and fishes in the absorption and subsequent retention of photodieldrin (a sunlight conversion product of the insecticide, dieldrin). The crayfish *Cambarus* and the clam *Simpsoniconcha* showed extremely low levels of absorption and accumulation while the larvae of the mosquito *Aedes*, the amphipod *Gammarus*, and the cladocerans *Simocephalus* and the fresh-water flea *Daphnia* showed much higher levels of this insecticide. Maximum absorption occurred within 12 to 24 hours of exposure in only a few invertebrates but in most fishes. Among fishes, five to six times higher levels were seen during this period in guppy and goldfish than in minnow and bluegill. While the livebearer, guppy, kept absorbing photodieldrin with time, other fishes showed a slight decline in their tissue levels of this insecticide. The maximum biological magnification ratios during peak periods of absorption were: 133 for bluegill, 150 for minnow, 609 for goldfish, and 820 for guppy. Among microcrustacea the maximum biological magnification ratios seen after four days of continuous exposure were about 1000 for *Simocephalus*, 1200 for *Gammarus*, and 63,000 for *Daphnia*. No appreciable in vivo metabolism of photodieldrin was seen in fishes, minnow, and bluegill, and the decline in their body levels of photodieldrin is apparently not due to detoxication of the latter. (Author abstract by permission)

75-0848. Davison, K. L.; Sell, J. L. (Agr. Res. Serv., Metab. and Radiat. Res. Lab., Fargo, ND 58102). **Dieldrin and DDT effects on reproduction and some hepatic mixed-function oxidases in the mallard duck.** *Arch. Environ. Contam. Toxicol. 2(4): 302-314; 1974.* (31 references)

Mallard ducks were fed 2, 20, or 200 ppm of technical DDT or chemically pure *p,p'*-DDT, or 1, 5, or 10 ppm of dieldrin for 343 days, which included parts of two laying seasons. All 18 ducks fed 200 ppm of *p,p'*-DDT and 17 or 18 ducks fed 200 ppm of technical DDT died during the experiment. The insecticides did not affect fertility or hatchability significantly. Tremors were exhibited by hatchlings from eggs laid during the second laying season by ducks fed ten ppm of dieldrin and from the one remaining duck fed 200 ppm of technical DDT. Liver weights or hepatic microsomal aniline hydroxylase and aminopyrine *N*-demethylase activities were not significantly affected in either ducklings or adults by the insecticides. Cytochrome P-450 concentration in hepatic microsomes of ducklings was increased significantly by feeding 200 ppm of DDT or ten ppm of dieldrin. Pesticide residues in eggs were variable but were higher the second season than the first and were dose dependent. (Author abstract by permission)

75-0849. Haegele, M. A.; Hudson, R. H. (Bur. Sport Fish. and Wildl., Denver Wildl. Res. Cent., Denver, CO 80225). **Eggshell thinning and residues in mallards one year after DDE exposure.** *Arch. Environ. Contam. Toxicol. 2(4): 356-363; 1974.* (17 references)

A group of 16 mallard hens (*Anas platyrhynchos*), that had been given feed containing 40 ppm of *p,p'*-DDE for 96 days, laid eggs with shells averaging about 15-20% thinner than those of ten control birds during and up to 42 days after treatment. In eight of the treated birds killed at that time, whole-body DDE residues averaged 33.1 ppm (wet weight). The other eight treated birds and ten controls were kept through the winter with no additional DDE exposure and penned separately five days for individual egg collection about three weeks after laying began in spring. At that time (nearly 11 months after DDE feeding had stopped), the treated birds laid eggs with shells averaging 7.4% thinner than control eggshells (significant at $P \leq 0.05$) and their whole-body DDE residues averaged 9.6 ppm (wet weight). Variations in eggshell thickness and DDE residues were considerable among treated birds. However, regression analysis showed moderate negative correlations (r = -0.51 to -0.62) between eggshell thickness and DDE residues in whole bodies and eggs, and strong positive correlations (r = 0.73 and 0.91) between DDE residues in whole bodies and in eggs. (Author abstract by permission)

75-0850. Lin, T.; Dorough, H. W. (Dept. Entomol., Univ. Kentucky, Lexington, KY 40506). **Influence of insecticide exposure on the in vivo and in vitro metabolic activity of rats.** *Arch. Environ. Contam. Toxicol. 2(4): 364-377; 1974.* (16 references)

Insecticides were administered to rats as single doses, oral and i.p., at approximately 1/10 their acute oral LD50 levels, or in the diet at concentrations where the daily intake was equivalent to the single doses. Carbofuran decreased the rate of urinary elimination of carbaryl-^{14}C from rats whereas Ruelene (crufomate) tended to increase the rates. However, the changes were minor, 12% or less, and the nature of the carbaryl metabolites was not altered. Carbaryl and carbofuran caused a reduction in liver protein of rats injected with the carbamates for five days, but had no effect when fed in the diet for 40 days. DDT increased the liver protein when injected but not when fed in the diet. When administered in combination, by injection or in the diet, DDT and carbaryl did not modify the protein content of the liver. Liver and kidney microsomes of rats fed DDT in the diet, alone or with carbaryl, resulted in increased oxidase activity. Neither of the compounds affected microsomal glucuronidation of 1-naphthol. In a four-week feeding study, the rate of weight gain was 15% less in animals fed carbaryl plus Ruelene or coumaphos plus Ruelene than in the control rats. No significant difference from the controls was observed with carbaryl or carbaryl plus carbofuran. Feeding these compounds did not affect urine pH; but the urea content was increased by all treatments and the glucose content increased by all except treatment with coumaphos plus Ruelene. (Author abstract by permission)

75-0851. Stern, P. (Dept. Pharmacol., Med. Fac., Sarajevo, Yugoslavia). **The effect of DDT on muscle dystrophy and its role in producing rest tremor.** *Arh. Hig. Rada Toksikol. 24: 297-302; 1973.* (38 references)

The property of DDT to provoke rest tremor was studied in an attempt to explain the mechanism of the tremor and find its antagonists. Wistar rats were given DDT (100 mg/kg in olive oil, p.o.). The following substances were tested for their effects on the tremor: atropine, sulfate, methylatropine nitrate, caramiphen, ethyl benztropine bromide, oxotremorine, guanethidine, α-methyldopa, penicillamine, 4-(1-naphthylvinyl)-pyridine, decaborane, glycine, aminooxyacetic acid, mephenesine, diazepam, α-hydroxybutyrate, α-methyl-*m*-tyrosine, *p*-chloramphetamine, and substance P. Only mephenesine and diazepam prevented DDT tremor completely. The tremor reappeared when these substances stopped acting. The increase of dopamine caused by α-hydroxybutyrate inhibited the DDT tremor but again not completely. DDT did not change the level of ACh in the whole brain or in corpus striatum. Therefore, DDT acts on the level of the spinal cord, affecting the spinal polysynaptic reflexes. Supraspinal mechanisms are of secondary importance. In a further experiment dystrophy of the hind legs of the rat was provoked. The animals were given 25 mg/kg DDT p.o. or 10 mg/kg dissolved in 0.2 cm^3 oil, for 15 days. DDT significantly increased the weight of dystrophic muscles, and the dystrophic changes in the muscles themselves were less pronounced than in the muscles of the control dystrophy group. The number of necroses decreased in the muscles of treated animals. DDT metabolites had no effect. It seems that the number of spontaneous impulses from motor neurones is increased and so the trophic effect on muscle is probably due to this mechanism.

75-0852. Mihara, K.; Miyamoto, J. (Res. Dept., Pestic. Div., Sumitomo Chem. Co. Ltd., Takarazuka, Hyogo, Japan). **Metabolism of Salithion (2-methoxy-4H-1,3,2-benzodioxaphosphorin-2-sulfide) in rats and plants.** *Agr. Biol. Chem. (Tokyo) 38(10): 1913-1924; 1974.* (19 references)

Metabolism of an organophosphorus insecticide, Salithion (2-methoxy-4H-1,3,2-benzodioxaphosphorin-2-sulfide), in male rats, rice plants, and bean plants was studied by using the carbon-14 labeled compound at the benzyl carbon. At the dosage of 9 mg/kg, 82.0% of the radiocarbon were excreted in urine within 24 hr after oral administration to male rats. Most of the administered radiocarbon was recovered into urine during one week. When the dosage level was increased to 45 mg/kg or when 9 mg/kg of Salithion was consecutively given 5 times, the radiocarbon was also rapidly excreted and substantially completely recovered, mostly in the urine. No radioactive CO_2 was expired. In the urine, at least 15 radioactive metabolites were detected by thin-layer chromatography (tlc), among which the following seven

compounds were identified by cochromatography with the authentic compounds and IR, NMR spectroscopy; *O*-(2-hydroxy) benzyl dihydrogen phosphate, desmethyl salioxon, *O*-(2-hydroxy) benzyl dihydrogen phosphorothioate, desmethyl salithion, salioxon, saligenin and Salithion, and the major one was desmethyl salithion. The intact Salithion was negligible. Most of ^{14}C-Salithion applied on bean plants and rice plants were vaporized and Salithion incorporated into plants underwent the cleavage of the cyclic phosphorus ester group to give saligenin which was conjugated with glucose at the benzyl-OH and phenol-OH (salicin). Except the above conjugates all the radioactive metabolites were included in those in rats urine. In bean plants, Salithion and desmethyl salithion were also found. (Author abstract by permission)

75-0853. Kacew, S.; Singhal, R. L. (Fac. Med., Univ. Ottawa, Ottawa, Ontario, Canada). **Role of cyclic adenosine 3′:5′-monophosphate in the action of 1,1,1-trichloro-2,2-bis-(*p*-chlorophenyl)ethane (DDT) on hepatic and renal metabolism.** *Biochem. J. 142(1): 145-152; 1974.* (52 references)

Whether alterations in the cyclic AMP-adenylate cyclase-phosphodiesterase system influence DDT action on hepatic and renal carbohydrate metabolism was investigated. Exogenous cyclic AMP (10 mg/100 g) mimicked DDT action which enhanced the activities of pyruvate carboxylase, phosphoenolpyruvate carboxylase, fructose 1,6-diphosphatase and glucose 6-phosphatase in liver and kidney cortex, elevated the concentration of blood glucose and urea, and decreased the amount of hepatic glycogen. Theophylline augmented the effects of a submaximal dose of this halogenated hydrocarbon on serum urea and glucose as well as the key gluconeogenic enzymes in liver and kidney cortex. DDT added to liver and kidney homogenates in vitro resulted in significant enhancement of adenylate cyclase activity. Hepatic and renal slices from rats treated with DDT displayed increased ability to convert [^{3}H]adenosine into cyclic [^{3}H]AMP. Whereas kidney-cortex slices excised from rats given caffeine and DDT produced even greater amounts of cyclic [^{3}H]AMP, imidazole, propanolol, and hydrazine prevented the insecticide-stimulated rise in cyclic nucleotide production. In contrast, prostaglandin E_1 exerted no significant effect on DDT-induced increases in cyclic [^{3}H]AMP synthesis from radioactive adenosine. These findings support the concept that the DDT-induced alterations in carbohydrate metabolism of liver and kidney cortex may be related to an initial stimulation of the cyclic AMP-adenylate cyclase system in these tissues.

75-0854. Olson, R. J.; Trumble, T. E.; Gamble, W. (Dept. Biochem. and Biophys., Oregon State Univ., Corvallis, OR 97331). **Alterations in cholesterol and fatty acid synthesis in rat liver homogenates by aryloxy acids.** *Biochem. J. 142(2): 445-448; 1974.* (15 references)

2,4-Dichlorophenoxyacetic acid and 2,4,5-trichlorophenoxyacetic acid inhibited the incorporation of [2-^{14}C]mevalonate into cholesterol and non-saponifiable lipids. Both compounds inhibited the conversion of [1-^{14}C]isopentenyl pyrophosphate into cholesterol and the synthesis of cholesterol and fatty acids from [2-^{14}C]acetate. There was no inhibition of the conversion of [1-^{14}C]mevalonate into CO_2. At low concentrations (0.5 m*M*) of the compounds there was a stimulation of acetate incorporation into fatty acids. (Author abstract by permission)

75-0855. Rao, G. H.; White, J. G. (Dept. Pediat., Univ. Minnesota, Sch. Med., Minneapolis, MN 55455). **Influence of esterase inhibitors on platelet aggregation and release induced by phorbol myristate acetate.** *Biochem. Pharmacol. 24(3): 293-295; 1975.* (14 references)

Phorbol myristate acetate (PMA), a tumor-promoting principle from croton oil, is a powerful platelet aggregant. Previous observations suggested that a factor present in plasma might interfere with the action of PMA; esterases might be the interfering factor, since PMA is a fatty acid ester. Eserine or paraoxon, esterase inhibitors, were added to platelet suspensions in plasma or Hanks medium on the platelet aggregometer 30 sec before addition of PMA. PMA-induced aggregation of citrate-platelet rich plasma (C-PRP) was markedly enhanced in the presence of paraoxon at $5.0 \times 10^{-5} M$. The esterase inhibitor did not influence aggregation in AWP (washed platelets). Eserine gave similar results. Effects of eserine and paraoxon were also evident on the 5-hydroxytryptamine release reaction stimulated by PMA. These findings should be considered when evaluating results obtained with PMA in a variety of test systems. The presence of esterases and esterase inhibitors in test cells and tissues should be taken into consideration in evaluating the action of any ester-active chemical.

75-0856. Lucier, G. W.; McDaniel, O. S.; Hook, G. E. R. (Nat. Inst. Health, Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **Nature of the enhancement of hepatic uridine diphosphate glucuronyltransferase activity by 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in rats.** *Biochem. Pharmacol. 24(3): 325-334; 1975.* (24 references)

After single low-level oral doses of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) to rats, hepatic microsomal *p*-nitrophenol (PNP) glucuronyltransferase activity was elevated approximately 6-fold, whereas the hepatic glucuronyltransferase conjugating testosterone or estrone was unaffected. Solubilized and purified PNP glucuronyltransferase and steroid glucuronyltransferases from control and TCDD-treated rats exhibited the same relative activities (TCDD:control) as when the enzymes were bound to the endoplasmic reticulum. Elevation of

PNP glucuronyltransferase was still evident 73 days after a single oral dose of 25 μg TCDD/kg. Female rats were more susceptible to TCDD actions on liver microsomal PNP glucuronyltransferase than males. The effects of TCDD treatment on PNP glucuronyltransferase appeared to be related to increased amounts of liver enzyme for the following reasons: *Km* values for PNP and UDPGA were unchanged by TCDD treatments; the magnitude of the TCDD-induced increase of PNP glucuronyltransferase activity was the same whether enzyme activity was measured in the presence or absence of Mg^{2+} or Triton X-100; TCDD, when added in vitro, had no detectable effect on enzyme activity; TCDD treatment of rats did not change total hepatic microsomal phospholipid or cholesterol contents; pH optima were unaffected by TCDD treatment; solubilization of enzyme was not accompanied by a change in the TCDD induction effect; and actinomycin D appeared to block the initial phase of induction. (Author abstract by permission)

75-0857. Hook, G. E. R.; Orton, T. C.; Moore, J. A.; Lucier, G. W. (Nat. Inst. Environ. Health Sci., Research Triangle Park, NC 27709). **2,3,7,8-tetrachlorodibenzo-*p*-dioxin-induced changes in the hydroxylation of biphenyl by rat liver microsomes.** *Biochem. Pharmacol. 24(3): 335-340; 1975.* (33 references)

Biphenyl 2- and 4-hydroxylase activities and cytochrome P-450 concentrations in microsomes were increased by oral doses of less than 1 μg TCDD/kg. Female rats were more sensitive than male rats to the inductive effects of TCDD, since highly significant increases in biphenyl-hydroxylating activities were observed at the dose level of 0.2 μg TCDD kg in female but not in male rats. The induction effect was very persistent: biphenyl 2- and 4-hydroxylase remained stimulated even after 73 days following a single oral dose of 25 μg TCDD/kg. The levels to which the hydroxylases were stimulated in female rats were the same as in male rats. Rats of all ages from 10 to 335 days responded to hepatic microsomal effects of TCDD to approximately the same degree. The enzyme inductive effect was diminished by the simultaneous administration of actinomycin D. The *Km* of biphenyl 2-hydroxlyase (1.42 m*M*) was not altered significantly by TCDD treatment, but the *Km* of biphenyl 2-hydroxylase (0.62 m*M*) was increased to approximately the same value (1.6 m*M*) as that of the 2-hydroxylase. The *V*max of biphenyl 4-hydroxylase was increased 4.5 fold but that of biphenyl 2-hydroxylase was increased 16.5-fold. Rates of 2β- and 16α-hydroxylation of testosterone were suppressed by TCDD but rates of 7α- and 6β-hydroxylation were unaffected. It would appear that the hepatic microsomal mixed-function oxidases responsible for the hydroxylation of biphenyl and testosterone are different. (Author abstract by permission)

75-0858. Chiou, C. Y. (Dept. Pharmacol. Ther., Univ. Florida, Coll. Med., Gainesville, FL 32610). **A simple and sensitive method for the determination of enzymatic hydrolysis of various esters.** *Biochim. Biophys. Acta 327(2): 374-379; 1973.* (10 references)

A simple method was developed to determine the enzymatic hydrolysis of various esters. The principle of this method is that $^{14}CO_2$ produced from interaction between $NaH^{14}CO_3$ and acid produced from esters hydrolyzed by esterases is trapped with 2-phenethylamine and counted with a liquid scintillation counter. The advantages of this method are manyfold: (a) it is much simpler and more sensitive than the Warburg technique, allowing the use of substrate concentrations as low as 10^{-4} *M* acetycholine; (b) it is applicable to any ester substrates, in contrast to spectrophotometric methods which are confined to thioesters as substrates; (c) it is much less expensive than the radioactive substrates used in the radioisotopic method; and finally, (d) it is much less complex in operation than the pH-stat method. (Author abstract by permission)

75-0859. Brestkin, A. P.; Parkhomenko, T. V. (I. M. Sechenov Inst. Evol. Physiol. Biochem., Acad. Sci. USSR, Leningrad, USSR). **Osobennosti stroyeniya aktivnogo tsentra propioniklholinesterazy iz syvorotki krovi kur. [Structural features of the active center of propionylcholinesterase from the serum of chickens.]** *Biokhimiya 38: 467-470; 1973.* (9 references) (Russian)

The interaction of propionylcholinesterase from chicken serum with various cholinesterase inhibitors was studied at 25°C in 0.002 *M* phosphate buffer at pH 7.5 to determine certain structural features of the active center of this enzyme. The addition of tetramethylammonium or diphenyl-*O*-(beta-phenylmethylamino)-ethylphosphinate iodomethylate even at a concentration of 0.05 *M* to the incubation medium caused no change in the catalytic activity of propionylcholinesterase during the hydrolysis of acetylcholine. The inhibitory activity of irreversible inhibitors, *O*-ethyl-*S*-(beta-ethylmercaptoethyl)methyl-thiophosphonate and *O,O*-diethyl-*S*-(beta-ethylmercaptoethyl)thiophosphate (isosystox, demeton), proved to be 60 to 70 times lower than the activity of respective methylsulfomethylates and methylsulfomethylate of isosystox. Such a small change in the inhibitory activity of these compounds appears to be associated exclusively with changes in the reactivity of the inhibitors, since introduction of a cationic group into the inhibitor molecule at a relatively small distance from the phosphorus atom substantially decreases the stability of the ester bond. The rate constant of alkaline hydrolysis increases by 60-70 times. The present findings, with those of experiments with *O*-ethyl-*S*-alkylmethyl-thiophosphonates, give evidence of the absence of an anionic binding site for positively charged and hydrophobic groups of the inhibitors on the active surface of propionylcholinesterase.

75-0860. Edery, H.; Guertzenstein, P. G. (Nat. Inst. Med. Res., London, England). **A central vasodepressor**

effect of dyflos. *Brit. J. Pharmacol. 50(4): 481-487; 1974.* (21 references)

Cats, anesthetized with pentobarbitone sodium and atropinized peripherally by i.v. injection of atropine methyl nitrate, received a topical application of dyflos (DFP) (1-20 mg/ml). The dyflos was applied to the ventral surface of the medulla oblongata at a region lateral to the pyramids and caudal to the trapezoid bodies. Dyflos produced a fall in arterial blood pressure without changing the heart rate and, in experiments without artificial ventilation, tachypnea with dissociation of thoracic and abdominal respiration. Atropine methyl nitrate (50 mg/ml) applied topically in the same manner prevented or abolished the vasodepressor effect of dyflos. Topical applications of obidoxime (100-200 mg/ml) and pralidoxime mesylate (100-200 mg/ml) abolished the vasodepression caused by dyflos. The reactivator compound 30 (100 mg/ml), also a pyridinium aldoxime, did not have this effect. Obidoxime and pralidoxime mesylate also reversed the vasodepression produced by carbachol applied to the ventral surface of the brain stem, but not the vasodepression produced by glycine similarly applied. It cannot be stated with certainty whether the reversal of the dyflos- and carbachol-induced vasodepression by obidoxime and pralidoxime is due to reactivation of acetylcholinesterase by dephosphorylation or decarbamylation, respectively, or to a central atropine-like action, or to a combination of the two effects.

75-0861. Hanstein, W. G.; Hatefi, Y. (Dept. Biochem., Scripps Clin. Res. Foundation, Dept. Biochem., La Jolla, CA 92037). **Characterization and localization of mitochondrial uncoupler binding sites with an uncoupler capable of photoaffinity labeling.** *J. Biol. Chem. 249(5): 1356-1362; 1974.* (11 references)

2-Azido-4-nitrophenol (NPA) is a potent, water-soluble uncoupler of oxidative phosphorylation. It is photochemically active and capable of covalent labeling of the mitochondrial components presumably concerned with the uncoupling process. Equilibrium binding studies with NPA, under nonphotolytic conditions, have shown that bovine heart mitochondria contain 0.56 nmole of a uniformly reacting uncoupler binding site/mg protein. The binding of NPA to these sites is competitively inhibited by other uncouplers, but not by antimycin A, rutamycin, valinomycin, or arsenate. The uncouplers tested against NPA were sodium azide, 2,4-dinitrophenol, pentachlorophenol, carbonylcyanide *m*-chlorophenylhydrazone, and 5-chloro-3-*t*-butyl-2′-chloro-4′-nitrosalicylanilide. The uncoupler binding sites are located in the inner membrane and do not involve ATPase. They are unaffected with respect to NPA binding by changes in the respiratory state or the energization state of mitochondria.

75-0862. Smith, L. L.; Wright, A.; Wyatt, I.; Rose, M. S. (Cent. Toxicol. Lab., Imperial Chem. Ind., Ltd., Cheshire, England). **Effective treatment for paraquat poisoning in rats and its relevance to treatment of paraquat poisoning in man.** *Brit. Med. J. 4(5044): 569-571; 1974.* (9 references)

After oral administration of a lethal dose of paraquat to rats the plasma concentration remained relatively constant over 4 to 30 hr and was related to the paraquat content of the small intestine over the first 16 hr. During the first 30 hr, the concentration of paraquat in the lung rose progressively above that of the plasma to levels which are capable of causing pulmonary damage. A treatment has been devised to prevent the absorption of paraquat into the plasma, thus preventing accumulation of paraquat in the lung. The treatment consists of a stomach wash followed by 4 administrations of bentonite plus purgatives at 2 to 3 hr intervals. Even when treatment was delayed until 10 hr after administration of paraquat, 80% survival was obtained. The finding that slices of human lung accumulate paraquat in the same manner as those of rat lung suggests that similar treatment may be relevant to poisoning cases in humans.

75-0863. Benke, G. M.; Murphy, S. D. (Dept. Physiol., Kresge Cent. Environ. Health, Harvard Univ., Boston, MA 02115). **Anticholinesterase action of methyl parathion, parathion and azinphosmethyl in mice and fish: onset and recovery of inhibition.** *Bull. Environ. Contam. Toxicol. 12(1): 117-122; 1974.* (16 references)

Determinations were made of the rate of onset and recovery of AChE inhibition in sunfish and male Charles River mice injected with parathion, methyl parathion, and azinphosmethyl. The compounds were administered i.p. in corn oil solutions, 2 ml/kg for fish and 5 ml/kg for mice. Mouse AChEs were inhibited much more rapidly than fish AChEs. This may result from a faster rate of production of the respective oxygen analogues and/or greater sensitivity of the AChE of mouse tissues relative to fish. Of the 3 compounds, methyl parathion produced the most rapid AChE inhibition in fish with maximal levels of inhibition occurring within 2 to 4 hr. Azinphosmethyl produced slight inhibition at 2 hr and maximal inhibition at 4 hr. Parathion did not cause maximum inhibition until 24 hr and was only slightly inhibitory at 10 hr. The greater toxicity of parathion relative to methyl parathion is thus not related to the speed of onset of AChE inhibition. In mice as well the AChE activities of parathion treated animals were depressed less rapidly than those following treatment with either methyl parathion or azinphosmethyl. The rate of recovery from AChE inhibition by all 3 pesticides in fish brain and muscle was much slower than for mice. This slow recovery may make the fish more susceptible to cumulative injury by these compounds.

75-0864. Mosser, J. L.; Teng, T. C.; Walther, W. C.; Wurster, C. F. (Dept. Bacteriol., Univ. Wisconsin, Madison, WI 53706). **Interactions of PCBs, DDT and**

DDE in a marine diatom. *Bull. Environ. Contam. Toxicol. 12(6): 665-668; 1974.* (20 references)

Thalossiosira pseudonana (strain 3H) was grown axenically in media containing methanol, DDT, DDE, and/or PCB. DDE and PCB alone inhibited growth to a minor extent, whereas together they inhibited it substantially. In contrast, DDT counteracted the toxicity of PCBs, whether added simultaneously with or 12-24 hours after the PCBs. Thus, the counteraction of PCB toxicity by DDT evidently involved an intercellular interaction. Interaction by DDT and DDE was only slight; growth inhibition caused by treatment with both substances (500 ppb each) was intermediate between that caused by either substance alone.

75-0865. Charnetski, W. A.; Stevens, W. E. (Agr. Canada Res. Station, Lethbridge, Alberta, Canada). **Organochlorine insecticide residues in preen glands of ducks: possibility of residue excretion.** *Bull. Environ. Contam. Toxicol. 12(6): 672-676; 1974.* (18 references)

Twenty-one ducklings representing five species (eight pintails, seven gadwalls, two blue-winged teal, one lesser scaup, and three baldpates) were collected from an area near Calgary, Canada where dieldrin had been used to control insect outbreaks. The preen glands were analzyed for pesticide residues using gas chromatography. The levels of DDT, DDE, and dieldrin in the preen glands were particularly high (0.25-3.77, 0.13-0.88, and 0.09-2.29, respectively) when compared with the food source in the environment. Since these insecticides were not found in the food or water, they must have been transferred from duck to duckling through the egg. In comparison to the other species, the ratio of total DDT to total DDE was higher in the blue-winged teal and scaup. Any bird with a well-developed preen gland can apparently excrete lipid soluble insecticides and their metabolites through the preen gland; these compounds could remain stable or be degraded by UV irradiation and the products subsequently ingested by the bird.

75-0866. Mahoney, J. J., Jr. (Biol. Dept., Kean Coll. of New Jersey, Union, NJ 07083). **Residue accumulation in white-throated sparrows fed DDT for 5 and 11 weeks.** *Bull. Environ. Contam. Toxicol. 12(6): 677-681; 1974.* (20 references)

Captured white-throated sparrows (*Zonotrichia albicollis*) from the Athens, Georgia vicinity were maintained for 5 or 11 weeks on diets containing 5 or 25 ppm technical grade DDT. The absolute body pesticide burdens increased significantly between the fifth and eleventh weeks of exposure at both treatment levels, indicating that the expected equilibrium level had not been reached after 5 weeks of exposure during the migratory period. The deposition of fresh lipid did not balance or dilute the added storage of pesticide. The absolute pesticide levels in the brains of the 25 ppm group decreased significantly between the fifth and eleventh weeks. The same trend was evident but not statistically significant for concentration values. In the 5 ppm group, there was no significant change in either measure of brain residues. The brains contained considerably less unaltered DDT than the bodies, the percentage of unaltered DDT varying by less than 10% between the 25 and 5 ppm groups at the same time.

75-0867. Uchiyama, M.; Chiba, T.; Noda, K. (Pharm. Inst., Tohoku Univ., Aobayama, Sendai, Japan). **Co-carcinogenic effect of DDT and PCB feedings on methylcholanthrene-induced chemical carcinogenesis.** *Bull. Environ. Contam. Toxicol. 12(6): 687-693; 1974.* (7 references)

Adult virgin female dd mice were maintained on standard laboratory chow or on a diet containing DDT or PCB (10 or 100 ppm). Previously, cotton thread impregnated with 20-methylcholanthrene (MC) had been inserted into the uterine cervix; the thread was removed 4 weeks later. The carcinogenic effect of MC was not affected by feeding 10-100 ppm PCB or 10 ppm DDT for 7 weeks after insertion of the MC-treated thread. However, DDT when fed at 100 ppm for 8 weeks (starting 1 week prior to insertion of the MC–treated thread) had a significant tumor-promoting effect. The drug metabolizing activities of the liver microsomes were stimulated by both PCB and DDT (100 ppm).

75-0868. Ward, D. V.; Howes, B. L. (Dept. Entomol. Econ. Zool., Rutgers Univ., New Brunswick, NJ 08903). **The effects of abate, an organophosphorus insecticide, on marsh fiddler crab populations.** *Bull. Environ. Contam. Toxicol. 12(6): 694-697; 1974,* (6 references)

Abate (biothion, 2% granular) was applied at a rate of 0.1 active ingredient per acre to spatially separated sites along both banks of a ditch in an unpolluted *Spartina alterniflora* marsh bordering Great Bay, New Jersey. The insecticide was applied 3 times with 2 week spacings between applications in simulation of conditions used for the Abate control of mosquito larvae. The Abate treatment significantly reduced (by 20%) the fiddler crab (*Uca pugnax*) population in the experimental plots as compared with control plots. In all plots, the number of crabs increased and then decreased as the summer proceeded. The decrease in the crab population may have been due to direct feeding on Abate granules by some individuals (leading to significantly increased exposure levels in these individuals) or to sublethal effects rendering the animals more easily subject to predation. The susceptibility of *Uca pugnax* to Abate should be considered in planning the use of organophosphorous compounds on marshlands.

75-0869. Ferrando, R.; Truhaut, R.; Graillot, C.; Gak, J. C.; Fourlon, C. (Lab. Nutr. Aliment., Ecole Nat. Vet.

Alfort, France). **Role de la vitamine A dans l'induction du cytochrome P-450 par le DDT. [Role of vitamin A in cytochrome P-450 induction by DDT.]** *C. R. Acad. Sci. Paris Ser. D 279(12): 999-1001; 1974.* (1 reference) (French)

The effect of vitamin A on the induction of cytochrome P-450 by DDT was studied in young Wistar rats. Vitamin A was administered in daily doses of 10 or 25 μg, and DDT was administered in 5 mg doses. Induction of cytochrome P-450 was found to occur only when a minimum quantity of vitamin A was supplied daily. A daily dose of 5 mg DDT requires about 10 μg vitamin A. A larger dose of vitamin A caused increased protein efficiency of the diet rather than a stepped-up cytochrome P-450 induction.

75-0870. Ferrando, R.; N'Diaye, A. L.; Henry, N.; Fourlon, C.; Gautier, F. (Lab. Nutr. Aliment., Ecole Nat. Vet., Alfort, France). **Influence d'un pretraitement du caneton par la DDT sur la reaction ulterieure vis-a-vis d'un tourteau d'arachide pollue par *Aspergillus flavus*. [Effect of DDT pretreatment of ducklings on subsequent response to a peanut oil cake contaminated with *Aspergillus flavus*.]** *C. R. Acad. Sci. Paris Ser. D 279(13): 1131-1134; 1974.* (4 references) (French)

The effect of DDT pretreatment of ducklings on the subsequent response to aflatoxin in peanut oil cake contaminated with *Aspergillus flavus* was studied. Like phenobarbital DDT attenuated the toxic effect of aflatoxin considerably, especially when it was administered for 8 days prior to administration of aflatoxin. The DDT concentration in the food was 100 mg/kg. The findings indicate the existence of priorities in the action of inducers of cytochrome P-450, and the involvement of vitamin A in the induction process.

75-0871. Lutz-Ostertag, Y.; Henou, C. (Lab. Biol. Anim., Universite de Clermont, Aubiere, France). **Action du Paraquat sur le tractus uro-genital de l'embryon de Poulet et de Caille. [Action of paraquat on the urogenital tract in chicken and quail embryos.]** *C. R. Soc. Biol. 168(2-3): 304-307; 1974.* (French)

The action of paraquat on the urogenital tract in chicken and quail embryos was studied in vivo and in vitro. In in vivo tests, eggs were sprayed with 0.4-1.4% aqueous solution of paraquat, while in vitro tests were conducted on cultures prepared 8.5-9 days after the start of the incubation. Paraquat was found to provoke pseudo-feminization of the males. The testes presented intersexual phenomena, and the regression of the muellerian ducts was inhibited. Considerable reduction of the gonocytes in both male and female embryos, indicative of a reduction of the reproductive function, was observed. Sex- and species-specific differences in the susceptibility to paraquat were demonstrated in in vitro tests.

75-0872. Elliot, J. M.; Marks, C. F.; Tu, C. M. (Res. Sta., Agr. Canada, Delhi, Ontario, Canada). **Effects of the nematicides DD and Mocap on soil nitrogen, soil microflora, populations of *Pratylenchus penetrans*, and flue cured tobacco.** *Can. J. Plant Sci. 54(4): 801-909; 1974.* (13 references)

Field studies were conducted for 2 yr on Fox loamy sand to compare the effect of broadcast D-D (mixture of 1,3-dichloropropene, 1,2-dichloropropane, and related C_3 hydrocarbons) and Mocap (*O*-ethyl *S,S*-dipropyl phosphorodithioate) on numbers of *Pratylenchus penetrans* (Cobb) Filip. and Stek. 1941, the nitrification processes in the soil, and the subsequent effects on flue-cured tobacco (*Nicotiana tabacum* L.) grown in a normal rye-tobacco rotation and, in 1 yr only, on an area fallowed the previous summer. Levels of NH_4^+-N in the soil in June tended to be higher, and NO_3^+-N lower with the D-D treatment, applied in early May, than in the untreated check. Mocap had no apparent effect on soil NH_4^+ and only inconsistent effects on soil NO_3^-. Although numbers of NH_4^+-N oxidizers and NO_2^-N oxidizers varied among treatments, the differences were inconsistent from week to week and did not appear to be related to soil NH_4^+ and NO_3^-. In 1971, D-D and Mocap gave good nematode control, but yield and dollar value were not different than with the check. Although both nematicides gave satisfactory control of nematodes in 1972, only D-D resulted in an increase in yield and value. The low yield in the Mocap and check plots in 1972 was probably due to loss of available N during a heavy June rainfall; soil N was less susceptible to leaching with the D-D treatment, as a higher amount was in the NH_4^+ form. (Author abstract by permission)

75-0873. Lewinsky, B. S.; Grigor, K. M.; Symington, T.; Neville, A. M. (Inst. Cancer Res., London, England). **The clinical and pathologic features of "non-hormonal" adrenocortical tumors. Report of twenty new cases and review of the literature.** *Cancer 33: 778-790; 1974.* (59 references)

A man aged 38 yr and a woman aged 65 yr presented with adrenocortical tumors. The man showed symptoms of weakness and tiredness for 5 yr, heart failure and hepatomegaly for 5 months, pain in the right upper quadrant, palpable mass, weight loss, ankle edema. Liver was palpable 6 cm. Intravenous pyelogram: ptosis of right kidney. Arteriogram: vascular component identified. The woman had had a right adrenal tumor removed 6 yr earlier. She presented with nausea, vomiting, and anorexia. Mass was found in the right loin and a skin nodule was noted. IVP: negative. Chest: multiple metastases in the lung. Complete excision of the tumor was achieved surgically in the woman, whereas only a partial removal was possible in the man. Postoperative radiotherapy for the man consisted of 2700 r in 35 days to the tumor bed. Postoperative chemotherapy was TDE 8 mg/day for 2 months,

prednisone 15 mg/day. Postoperative radiotherapy in the woman consisted of 4896 r in 52 days to the tumor with minimal change in its size. Postoperative chemotherapy was as follows: June 2, 1971 to Dec. 11, 1971: cyclophosphamide and vincristine sulfate. March 3, 1972 to May 26, 1972: methotrexate. June 3, 1972 to June 4, 1972: 5-fluorouracil (2 doses only due to development of a duodenocolic fistula) and TDE 8 mg/day; dexamethasone 2 mg/day from July 1972 onwards. Due to the slow response to TDE, such therapy should be continued for at least 8 weeks, provided side effects are not too severe. The dramatic but short-lived response to combination chemotherapy in addition to radiotherapy in the woman above suggests that this form of therapy may be more effective than TDE alone.

75-0874. Gee, M. G.; Griffiths, N. M.; Fenwick, R. G. (Agri. Res. Counc., Food Res. Inst., Colney Lane, Norwich, England). **Potential metabolites of phenolic disinfectants: preparation and odour properties of some anisoles.** *Pestic. Sci. 5: 703-708; 1974.* (14 references)

As some chlorophenols present in wood shavings have been shown to be microbiologically methylated to form anisoles, which have caused taint in broiler chickens, the anisoles from a number of phenols used in formulations of broiler house disinfectants were prepared. The sensory properties of these compounds were investigated in order to determine their potential for producing taint. None of these anisoles were found to be likely to cause taint if formed within the broiler house. (Author abstract by permission)

75-0875. Lawley, P. D.; Shah, S. A.; Orr, D. J. (Royal Cancer Hosp., London, England). **Methylation of nucleic acids by 2,2-dichlorovinyl dimethyl phosphate (dichlorvos, DDVP).** *Chem.-Biol. Interactions 8(3): 171-182; 1974.* (25 references)

Methylation of DNA and RNA by dichlorvos in vitro with isolated nucleic acids, and in cells of *E. coli* and the human tumor cell HeLa, was investigated. With respect to cytotoxic action, dichlorvos partly resembles methyl methanesulfonate (MMS) rather than *N*-methyl-*N*-nitrosourea. Dichlorvos is a weaker methylating agent for nucleic acids, but the pattern of products is closely similar. Dichlorvos owes more of its cytotoxic ability than does MMS to its inhibition of cell division by alkylation of cellular constituents other than nucleic acids. Dichlorvos is apparently a feeble mutagen. From its methylating properties, this is not unexpected. Its lack of ability to induce mutations in mammalian systems is partly due to its rapid metabolic degradation to non-alkylating products so that the extents of methylation of DNA achieved in vivo will be even more limited than those found in the current study. In *E. coli* cells, 3-methyladenine, the principal minor product in methylated DNA apart from 7-methylguanine, was not detected; whereas this was present when pre-isolated DNA was methylated. The overall extent of methylation was small, but in *E. coli* cells, specific excision of the minor product was indicated. The biological hazard of dichlorvos rests on future assessment of the extent of methylation of DNA which could result in vivo and on the quantitative relation between such methylation and its repair and various biological effects such as mutagenesis, and the possibly associated phenomenon of tumor initiation.

75-0876. Williams, G. M. (Dept. Pathol., Temple Univ. Sch. Med., Philadelphia, PA 19140). **The direct toxicity of alpha-naphthylisothiocyanate in cell culture.** *Chem.-Biol. Interactions 8(6): 363-369; 1974.* (18 references)

Studies involving the effect of inhibitors and inducers of microsomal enzymes on the production of jaundice by alpha-naphthylisothiocyanate (ANIT) support the idea that ANIT is enzymatically converted to a more toxic derivative. The present investigation examined this possibility through a study of the toxicity of ANIT on cultured cells. The line ARL 3 was initiated from the liver of a male Wistar rat. Other lines used were HeLa, 3T6, and HTC. ANIT was quite toxic as 6.25×10^{-5} *M* was capable of killing over 50% of the cells in 5 hr. The level of toxicity suggests that the compound is directly toxic, but also could indicate a high level of metabolism. A variety of possible ANIT derivatives were similarly tested and compared to ANIT at a concentration of 1 m*M*, at which ANIT kills more than 99% of the cells in the culture. Structural modifications of the isothiocyanate side chain abolished toxicity. Modifications of the naphthalene nucleus or even elimination and substitution by an alkyl group did not increase toxicity. Thus it appears that the toxicity of ANIT depends on the isothiocyanate moiety. The toxicity of ANIT on 2 lines of non-liver origin was compared to that on lines of liver derivation. No differences which would indicate different degrees of metabolism were found, thus, either metabolizing activity is widespread and comparable or it is not required for toxicity. The toxicity of ANIT following pretreatment with cycloheximide (5 μg/ml) and SKF 525A was unaltered. Further, it was not possible to increase toxicity by attempting to increase metabolism with an inducer of microsomal enzymes such as benzanthracene. It is concluded that ANIT is toxic without biotransformation.

75-0877. Stevens, J. T.; Zemaitis, M. A.; Greene, F. E. (Milton S. Hershey Med. Cent., Pennsylvania State Univ., Hershey, PA 17033). **Alteration of the binding constants of malathion and carbaryl to cytochrome P-450 due to hydrolysis by rat hepatic microsomal esterases.** *Chem.-Biol. Interactions 8(6): 415-420; 1974.* (8 references)

The relation between the susceptibility of a compound to hydrolysis by hepatic microsomal esterases and its ability to bind to cytochrome P-450 was

examined. The data demonstrates that, if the liver esterases are inhibited with BNPP, the rate of spectral decay and *Ks* for both malathion and carbaryl are reduced. The rate of spectral decay is related to the activity of the hepatic microsomal esterases. Further, addition of purified esterases to BNPP-pretreated (esterase inhibited) microsomes increases the rate of spectral decay of malathion, which indicates that the BNPP-induced changes are specific for microsomal esterases, and the apparent changes in binding constants of malathion in BNPP-pretreated rats are not due to specific effects of BNPP on cytochrome P-450 *per se*. Thus, hepatic microsomal esterases are important in the detoxification of anticholinesterase insecticides such as carbaryl and malathion. It is noted that potential interactions between the oxidative and hydrolytic 'detoxification' systems of the liver may not always be apparent. If a compound can be metabolized by either system, its ultimate metabolic fate and toxicological activity may be dependent on the interaction of the two systems.

75-0878. Sikka, H. C.; Schwartzel, E. H.; Saxena, J.; Zweig, G. (Life Sci. Div., Syracuse Univ. Res. Corp., Syracuse, NY 13210). **Interaction of dichlone with human erythrocytes. I. Changes in cell permeability.** *Chem-Biol. Interactions 9(4): 261-272; 1974.* (37 references)

The effect of dichlone on the membrane permeability of normal human erythrocytes was studied. The uptake of the fungicide was extremely rapid, reaching a maximum within 5 minutes. Most of the dichlone taken up was present in the interior of the cell; only about 5% remained bound to the cell membrane. The pesticide (3×10^{-5} to 10^{-4} *M*) induced a rapid loss of intracellular potassium and the leakage of K^+ varied with the fungicide and cell concentration. Pretreatment of the cells with glutathione reduced the potassium loss. Dichlone also increased osmotic fragility and inhibited Na^+-K^+ ATPase, which is associated with active ion transport. However, the leakage of potassium did not appear to be related to the interference with active ion transport. Dichlone probably produced its effect by increasing passive cation permeability, probably as a result of direct action on the membrane structure. Dichlone induced hemolysis, but only at concentrations higher than those which resulted iin K^+ loss. The loss of hemoglobin appeared to be due primarily to osmotic swelling of the treated cells. Exposure of erythrocytes to the fungicide also resulted in a rapid and extensive formation of methemoglobin and a denaturation of hemoglobin.

75-0879. Kilzer, L.; Bieniek, D.; Klein, W.; Korte, F. (Inst. Oekol. Chem., Gesellschaft Strahlen- und Umweltforsch. mbH, Schloss Birlinghoven, Germany). **Beitraege zur oekologischen Chemie. LXII Mikrosynthese des Aldrin-Dieldrin-Metaboliten trans-4,5-dihydroxy-4,5-dihydroaldrin-^{14}C. [Microsynthesis of the aldrin-dieldrin metabolite trans-4,5-dihydroxy-4,5-dihydroaldrin with carbon-14.]** *Chemosphere 2(4): 157-160; 1973.* (14 references)

An improved method is described for synthesizing aldrin-trans-diol containing a carbon-14 tracer for use in investigating the behavior of this metabolite of aldrin and dieldrin when ingested by various organisms. Previous preparation methods gave a yield of 10% or less of the crystallized substance, insufficient for radioactive microsynthesis. The new process has a 52% yield. Use of a water-dioxane mixture instead of water (higher solubility) boosts the yield to 42%, while the remaining improvement is achieved by increasing reaction time to 140 hours, twice that of the previous method.

75-0880. Bedford, C. T.; Harrod, R. K. (Shell Res. Ltd., Tunstall Lab., Sittingbourne, Kent, England). **Synthesis of *anti*-12-hydroxyendrin and 12-ketoendrin, the two major mammalian metabolites of endrin.** *Chemosphere 2(4): 163-168; 1973.* (8 references)

Bicycloheptadiene and hexachlorocyclopentadiene (hex) were heated in mesitylene, yielding the *syn* and *anti* isomers of 12-benzoyloxy isodrin (III and IV) and *syn*-12-benzoyloxyaldrin (V). Each of the crude alcohols was epoxidized with *m*-chloroperoxybenzoic acid in CH_2Cl_2 to yield *anti*-12-hydroxyendrin (VII) and *syn*-12-hydroxydieldrin (VIII). Comparison by IR, NMR, GLC, and TLC showed that VII and 12-ketoendrin (IX, formed by treatment of *syn*-12-hydroxyendrin with CrO_3, pyridine and CH_2Cl_2) were identical with the metabolites of endrin which have been isolated from rat excreta. The three major addition products which have been identified are the result of three of the four possible *endo* and *exo* attacks of *hex* on 7-benzoyloxy[2.2.1]hepta-2,5-diene.

75-0881. Alam, M. T.; Corbeil, M.; Chagnon, A.; Kasatiya, S. S. (Serv. Lab., Min. Affaires Soc. Quebec, Quebec, Canada). **Chromosomal anomalies induced by the organic phosphate pesticide guthion in Chinese hamster cells.** *Chromosoma 49(1): 77-86; 1974.* (19 references)

Chromosomal anomalies associated with the use of the organic phosphate pesticide guthion were investigated in Chinese hamster cells (line CHO-K1). Chromatid breaks and exchanges were most commonly observed. Mild failure of condensation, despiralization, secondary constriction, gaps, pulverization, ring and dicentric chromosomes were infrequently noted. A significantly higher number of chromosome breaks/cell occurred in treated than in control cells. Autoradiographic studies showed that, while higher doses of the chemical (80-120 μg/ml) arrested cells and prevented their movement out of S phase, a lower dose (60 μg/ml) caused a progression delay. No apparent difference existed in the incidence of total breaks between no. 1 and no. 2 chromosomes in

relation to their relative lengths. However, significant differences in the nonrandom distribution of breaks in no. 1 and no. 2 chromosomes indicated linear differentiation of breakage susceptibility along the chromosomes. An increased concentration of breaks was observed in the long arms of both no. 1 and no. 2 chromosomes. These results suggest that guthion, as well as inducing chromosomal anomalies, may produce a viable mutant.

75-0882. Banay-Schwartz, M.; Teller, D. N.; Gergely, A.; Lajtha, A. (New York State Res. Inst. Neurochem. Drug Addiction, Ward's Island, N.Y.). **The effects of metabolic inhibitors on amino acid uptake and the levels of ATP, Na^+, and K^+ in incubated slices of mouse brain.** *Brain Res. 71:117-131; 1974.* (18 references)

The effect of various metabolic inhibitors on the uptake of amino acids and on the levels of ATP, Na^+, and K^+ were compared in incubated slices of mouse brain. With increasing inhibitor concentration, the amino acid uptake, ATP, and K^+ decreased, whereas Na^+ increased. Fluoride inhibited aspartate and glutamate uptake less than that of other amino acids. The amino acids had no effect on Na^+ or K^+ levels, but the presence of glutamate and aspartate usually resulted in the further decrease in ATP. ATP can be lowered from levels similar to those present in vivo to less than 1% of that, but a small uphill (concentrative) amino acid uptake remains. A small (5-20) decrease in ATP had no significant effect on uptake. There were differences in the degree of decrease of ATP and of amino acid uptake. ATP was lowered much more than amino acid uptake by iodoacetate, and also, to some degree, by cyanide, but fluoride lowered uptake more than ATP. These results further support the concept that the level of ATP is not the main control of metabolite transport in the brain. The relative potency of the various inhibitors (30% inhibition of amino acid uptake) varied. Rotenone at 50 n*M* was most effective, followed by valinomycin, oligomycin, ouabain, gramicidin-D, dinitrophenol, iodoacetate, iodosobenzoate, cyanide, amytal, fluoride, and fluoroacetate (at 1.5 mM).

75-0883. Grossi, F. (Scuola di Spezializzazione in Malattie del Fegato e del Ricambio, Universita di Roma, Rome, Italy). **Induzione enzimatica microsomiale. [Microsomal enzyme induction.]** *Clin. Ter. 69:241-262; 1974.* (112 references) (Italian)

Studies on the mechanisms and significance of microsomal enzyme induction are reviewed. Certain pesticides, such as DDT, chlordane, BHC, and dieldrin were found be powerful inducers of microsomal enzyme activity. Enzyme induction substantially reduces the toxicity of such substances as pentobarbital, coumarin derivatives, and warfarin.

75-0884. Schulte-Hermann, R. (Inst. Toxicol. Pharmakol., Philips-Univ. Marburg, Lahn, Germany). **Induction of liver growth by xenobiotic compounds and other stimuli.** *Crit. Rev. Toxicol. 3(1): 97-158; 1974.* (550 references)

A large number of xeonobiotic compounds induce growth in the animal liver, including the pesticides DDT and BHC. Cell multiplication, cell ploidization, and cell hypertrophy contribute to the growth response in varying ratios. Liver enlargement is dose dependent and recedes after withdrawal of the inducer, but the hyperplastic growth component probably persists in the period of involution. An increased ability of the liver to metabolize lipophilic compounds is usually, but not invariably, associated with the induction of liver growth by chemical inducers; hypertrophy is suspected as the cause of the growth process. Liver growth of an apparently similar nature is elicited by a variety of experimental conditions which increase the functional load of the organ. Activation of the genetic apparatus is probably involved in the growth response, but the initial events responsible for the release of the inductive process are essentially unknown. Although pathological signs are not usually detected in the enlarged livers, adverse effects may possibly arise from increased mixed-function oxidase activities and from altered sensitivities towards hepatotoxins or carcinogens.

75-0885. Wheeler, L.; Strother, A. (Dept. Pharmacol., Loma Linda Univ. Sch. Med., Loma Linda, CA 92354). **In vitro metabolism of ^{14}C-pesticidal carbamates by fetal and maternal brain, liver, and placenta of the rat.** *Drug Metab. Disposition 2(6): 533-538; 1974.* (24 references)

The in vitro metabolism of the phenyl *N*-methylcarbamates, Zectran (mexacarbate) and Mesurol (methiocarb), was investigated using fetal and maternal tissues of Sprague-Dawley rats. The major ether-extractable metabolite resulting from Zectran metabolism in fetal and maternal brain in vitro was the *N*-demethylated compound, 4-methylamino-3,5-xylyl methylcarbamate (MA). Fetal brain and maternal brain converted 12.2% and 11.7%, respectively, of the ^{14}C-Zectran added in vitro to MA. No metabolic activity toward Zectran was noted in fetal liver and placenta. The highest metabolic activity of any tissue examined occurred in the maternal liver. *N*-Demethylation (15.8%) and *N*-methyl hydroxylation (13.6%) were the quantitatively important routes of metabolism observed. The major routes of metabolism identified in Mesurol studies were sulfoxidation and hydroxylation to ether-soluble metabolites. Both of these routes occurred in maternal liver, 12.3% and 7.9%, respectively. Fetal liver possessed significant sulfoxidation activity (23.1%). The proportion of ^{14}C-containing compounds that became water-soluble upon incubation with fetal liver was 36.0%, compared to 3.8% in controls, which contained boiled tissue. Placental tissues produced a small amount of the sulfoxide, 4-methylsulfinyl-3,5-xylyl methylcarbamate (3.2%). Fetal and maternal brain possessed no

measurable metabolic activity toward Mesurol. The transfer of these metabolites may be important to human safety since it has been shown that human liver biopsy samples metabolized these pesticidal carbamates similarly to the rat. These carbamates and their metabolites are already potent esterase inhibitors. The fact that the fetus could potentially convert the pesticides to more potent esterase inhibitors must be noted.

75-0886. Strik, J. J. T. W. A. (Inst. Vet. Pharmacol. Toxicol., State Univ., Utrecht, The Netherlands). **Species differences in experimental porphyria caused by polyhalogenated aromatic compounds.** *Enzyme 16: 224-230; 1973.* (12 references)

Some of the compounds which can produce porphyria are known to be environmental contaminants. Polyhalogenated aromatic compounds like phenobarbital stimulate drug metabolism and heme synthesis in many species. Chronic exposure to polyhalogenated aromatic compounds causes porphyria and liver damage in man, rats, rabbit, Japanese quail, and chicken, but not in the young rat, guinea pig, mouse, mink, minipig, kestrel, cormorant, or blue heron. Japanese quail and chicken are much more sensitive in developing porphyria caused by polyhalogenated aromatic compounds than are the rat, rabbit, and man. Species difference correlate with nourishment and natural diet, especially protein-rich feeding. Differing effect are also due to differences within and between species, the physoiological state of the animal, dosage, route of administration, age, and feeding.

75-0887. Johnson, W. W. (Dept. Biol., Univ. New Mexico, Albuquerque, NM 87131). **Coadaptation and recessive lethal content in DDT resistant populations of *Drosophila melanogaster*.** *Evolution 28(2): 251-258; 1974.* (30 references)

Three parallel laboratory populations of *Drosophila melanogaster* were established. One population was subjected to mild selection for DDT resistance, one was subjected to stringent selection for DDT resistance, and the third served as an unselected control. After 15 months of selection, the two experimental populations did not differ in level of resistance, but they were about 50-80 times more resistant than the control. Tests for the homozygous viability of second chromsomes from the control were conducted during the period in which resistance was developing in the experimental populations. At the end of the selection period, samples of chromosomes from the control and experimental populations showed no significant differences in the frequencies of recessive lethals, nor were there marked differences in the rates of allelism. Low interpopulational lethal allelism indicated that nearly unique levels of these factors existed in the populations after 20 months. That the lethals did not play a role in DDT resistance was evidenced by the low allelism of lethals from the resistant populations. Higher viabilities of intrapopulational lethal chromosome heterozygotes as compared to interpopulational combinations was interpreted as an indication that coadaptaion of the genes in each of the populations has taken place. There was no evidence that the lethals present in the populations had a positive viability effect within the coadapted genotypes.

75-0888. Woodin, A. M. (Strangeways Res. Lab., Cambridge, CB1 4 RN, England). **Action of organophosphorus compounds on the *p*-nitrophenyl phosphatase of membranes from rabbit and guinea pig polymorphonuclear leucocytes.** *Exp. Cell Res. 89(1): 15-22; 1974.* (14 references)

The *p*-nitrophenyl phosphatase activity of membranes from rabbit and guinea pig leukocytes is stimulated by organophosphorus compounds such as DFP and its non-phosphorylating analog, triisopropyl phosphate. Stimulation by triisopropyl phosphate can be distinguished from that of the non-ionic detergent Lubrol; triethyl phosphate and trimethyl phosphate have little effect. The effect on the membrane leading to *p*-nitrophenyl phosphatase stimulation may represent the basis of locomotion inhibition and enhancement of leukocidin action in the leukocyte. The hypothesis that organophosphorus compounds act on cells exclusively as inhibitors of esterases is unsatisfactory. The *p*-nitrophenyl-phosphatases of rabbit and guinea pig leukocyte membranes differ in some respects, and a study of the enzymes in related cells may reveal further species differences.

75-0889. Woodin, A. M. (Strangeways Res. Lab., Cambridge, CB1 4RN, England). **Action of organophosphorus compounds on the cation-sensitive *p*-nitrophenyl phosphatase of membranes from the retinal nerve of the squid.** *Exp. Cell Res. 89(1): 23-30; 1974.* (14 references)

The cation-sensitive *p*-nitrophenyl phosphatase of nerve membranes is inhibited by diisopropylphosphorofluoridate (DFP) and its non-phosphorylating analog triisopropyl phosphate. The inhibition requires 5-20 m*M* concentrations and is partly irreversible. The inhibition is distinct from that produced by the non-ionic detergent lubrol. Under some conditions dithiothreitol inhibits the enzyme activity, while under other conditions it protects it against inactivation. The extent of the inactivation by diisopropylphosphorofluoridate and triisopropyl phosphate is reduced in the presence of dithiothreitol. The primary action of the organophosphorus compounds is to change the reactivity of membrane sulfydryl or disulfide groups. The inhibition of the *p*-nitrophenyl phosphatase of nerve membrane by diisopropylphosphorofluoridate and triisopropyl phosphate occurs under conditions similar to those in which they block conduction in the axon. Changing the reactivity of the membrane sulfhydryl and disulfide

groups could lead independently to blocking conduction in the axon and inhibition of the *p*-nitrophenyl phosphatase in the isolated membrane.

75-0890. Dinu, I.; Boghianu, L.; Ghizelea, L.; Ozeranschi, L. (Inst. Public Hyg. Sanit., Bucharest, Rumania). **Influenta pesticidelor Zineb si Tiuram asupra activitatii unor enzime hepatice. [The influence of pesticides (zineb and thiram) on the activity of some hepatic enzymes.]** *Igiena 23(7): 437-442; 1974.* (11 references) (Rumanian)

The general and enzymatic effect of zineb and thiram was studied in albino rats in acute and chronic oral poisoning. In an acute experiment, 1/5 of LD50 caused reduction of the growth rate and hypertrophy of the liver. Zineb caused reduction of the glutamic-oxalacetic transaminase activity. Repeated administration for 90 days in doses of 100 ppm in food caused a similar reduction in the growth rate and of the glutamic-oxalacetic transaminase. Thiram decreased the food utilization efficiency.

75-0891. Patil, T. N.; Radhakrishnamurty, R. (Cent. Food Technol. Res. Inst., Mysore, India). **Effect of norbormide on blood glucose levels in albino rats.** *Indian J. Biochem. Biophys. 10: 206-208; 1973.* (15 references)

Norbormide was administered to albino Wistar rats, albino Wistar mice, and C-17 brown mice mixed in the diet, via stomach tube, or i.p. The dose level in each case was 102 mg/100 gm body weight. Regardless of mode of administration, the glucose levels in the blood of the norbormide-treated rats were 100-130% elevated (compared with controls) when they became comatose 0.5-2 hours after treatment. This effect was seen in rats fasted 17 hours, but not 48 hours, before treatment. The animals receiving norbormide also had significantly reduced liver glycogen and glutathione levels; the glycogen levels in the skeletal muscle were also reduced. Norbormide had no effect on the blood glucose levels of the two strains of mice tested, nor did it lead to coma. Insulin (2-5 units) counteracted the hyperglycemic effect of norbormide in rats, but did not protect against the other toxic manifestations and subsequent death. Thus the hyperglycemic effect induced by norbormide may not be the major cause of death.

75-0892. Chand, N. (Dept. Physiol. Pharmacol., Coll. Vet. Med., Pantnagar, Nainital, India). **Effect of 3′,4′-dichloropropionanilide on some biochemical constituents in the blood of buffalo calves.** *Indian J. Med. Sci. 28: 76-79; 1974.* (11 references)

DCPA (100 or 250 mg/kg) was administered orally to 11 yearling male buffalo calves maintained on green fodder. Twenty-four hours later, blood was collected from the jugular vein. DCPA at both dose levels caused significant hyperglycemia and hyperglobulinemia, and significant reductions in the serum albumin, albumin-globulin ratio (A/G ratio), and serum phosphorus. There was no significant effect on the total serum protein, alkaline phosphatase, or serum calcium levels. The effects of the lower dose were significantly greater than those of the higher dose, possibly because fewer animals received the higher dose. DCPA may produce its toxic effect via interference with carbohydrate, protein, and mineral metabolism.

75-0893. Tiedje, J. M.; Hagedorn, M. L. (Dept. Crop Soil Sci., Michigan State Univ., East Lansing, MI 48824). **Degradation of alachlor by a soil fungus, *Chaetomium globosum*.** *J. Agr. Food. Chem. 23(1): 77-81; 1975.* (13 references)

Degradation of alachlor [2-chloro-2′,6′-diethyl-*N*-(methoxymethyl)acetanilide] by a common soil fungus, *Chaetomium globosum*, produced chloride and four identifiable organic metabolites: 2-chloro-2′,6′-diethylacetanilide, 2,6-diethyl-*N*-(methoxymethyl)aniline, 2,6-diethylaniline, and 1-chloroacetyl-2,3-dihydro-7-ethylindole. Incubation of *C globosum* with 2-chloro-2′,6′-diethylacetanilide, 2,6-diethylacetanilide, 2-6-diethylaniline, and monochloroacetic acid showed further degradation of these products. Six other soil fungi studied were unable to effectively degrade alachlor. (Author abstract reprinted by permission of the American Chemical Society)

75-0894. Bollag, J. M.; Czaplicki, E. J.; Minard, R. D. (Lab. Soil Microbiol., Dept. Agron., Pennsylvania State Univ., University Park, PA 16802). **Bacterial metabolism of 1-naphthol.** *J. Agr. Food Chem. 23(1): 85-90; 1975.* (23 references)

Bacterial isolates from river water metabolized 1-naphthol by different pathways. After 60 hr of incubation with 1-naphthol-*1*-^{14}C, 44% of the radiolabeled material was trapped as $^{14}CO_2$, 17% remained in the growth medium, and 22% was recovered in the bacteria. The medium in which the bacteria were grown was extracted with diethyl ether and analyzed. The main product of the ether extract was isolated by thin-layer chromatography and identified by infrared, nuclear magnetic resonance, and mass spectroscopy as 4-hydroxy-1-tetralone [4-hydroxy-3,4 dihydro-(2H)-naphthalenone (1)]. The formation of this product and its metabolic implications for a probable pathway are discussed. (Author abstract reprinted by permission of the American Chemical Society)

75-0895. Ohsawa, T.; Knox, J. R.; Khalifa, S.; Casida, J. E.* (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Metabolic dechlorination of toxaphene in rats.** *J. Agr. Food Chem. 23(1): 98-106; 1975.* (10 references)

Rats treated orally with [^{36}Cl]toxaphene and each of seven fractions of [^{36}Cl]toxaphene of equal total chlorine content excrete 50-60% of the ^{36}Cl in urine and 30-40% in feces within 14 days. In each case about half of the dose is excreted as chloride ion determined as phenylmercuric [^{36}Cl]chloride. Similar studies with ^{14}C-labeled preparations of toxaphene and one or both of two components of high mammalian toxicity, toxicant A and B, establish that the feces contain unmetabolized compound and that the metabolites probably include acidic materials, products formed by partial or complete dechlorination and [^{14}C]carbon dioxide. The tissues retain relatively low levels of [^{14}C]toxaphene or ^{14}C-labeled toxicant B. The structural features important for high toxicity to house flies and mice are present in only a few toxaphene components while those conferring biodegradability appear to be shared by most if not all components. (Author abstract reprinted by permission of the American Chemical Society)

75-0896. Ueda, K.; Gaughan, L. C.; Casida, J. E.* (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Metabolism of (+)-*trans*- and (+)-*cis*-resmethrin in rats.** *J. Agr. Food Chem. 23(1): 106-115; 1975.* (18 references)

Rats treated orally at about 1 mg/kg with either 5-benzyl-3-furylmethyl (+)-*trans*-chrysanthemate [(+)-*trans*-resmethrin] or the corresponding (+)-*cis* compound excrete the following metabolites: no esters with (+)-*trans*-resmethrin; two unidentified esters with (+)-*cis*-resmethrin; 5-benzyl-3-furoic, 5-(*a*-hydroxybenzyl)-3-furonic, and 5-(4′-hydroxybenzyl)-3-furoic acids; chrysanthemic acid, chrysathemumdicarboxylic acid, and the intermediate alcohol and aldehyde oxidation products; conjugates of each of these acids. The metabolite(s) peristing longest in the body is derived from the alcohol moiety of (+)-*trans*-resmethrin. The isobutenyl moiety is oxidized at either the cis or trans methyl group with (+)-*cis*-resmethrin but only at the trans methyl group with (3)-*trans*-resmethrin. An unanticipated metabolic pathway involves epimerization at C-3 of the cyclopropane group leading to excretion of isomerized forms of chrysanthemic and hydroxylated chrysanthemic acid. Three of the (+)-*trans*-resmethrin metabolites are much more toxic than the parent compound. (Author abstract reprinted by permission of the American Chemical Society)

75-0897. Liu, L. C.; Cedeno-Maldonado, A. (Agr. Exp. Station, Mayaguez Campus, Univ. Puerto Rico, Rio Piedras, Puerto Rico). **Effects of fluometuron, prometryne, ametryne, and diuron on growth of two *Lemna* species.** *J. Agr. Univ. P. R. 63(4): 483-488; 1974.* (9 references)

The effect of fluometuron, prometryne, ametryne, and diuron on growth of floating hydrophytes, *Lemna major* L. (*Spirodela polyrrhiza*) and *Lemna perpusilla* Torr. were studied. Concentrations of the herbicides used ranged from $2 \times 10^{-5} M$ to $1 \times 10^{-8} M$. Fluometuron was the least toxic herbicide to both *L. major* L. and *persilla* Torr. Diuron was the most toxic to *L. major* at a concentration of $1 \times 10^{-6} M$. The other two herbicides were about equally toxic to *L. perpusilla*. Concentrations required to cause 50% growth inhibition of *L. major* were: fluometuron, $2.6 \times 10^{-6} M$; prometryne $3.5 \times 10^{-7} M$; ametryne, $2.3 \times 10^{-7} M$; and diuron, $1.75 \times 10^{-7} M$. Concentrations which inhibitied 50% growth of *L. perpusilla* were: fluometuron, $2.05 \times 10^{-6} M$; diuron, $6.4 \times 10^{-8} M$; prometryne, $5.4 \times 10^{-8} M$; and amytryne, $4.6 \times 10^{-8} M$. It is noted that the fluometuron concentration causing 50% growth inhibition of *L. major* was about 10-fold that of the other herbicides. Similarly, the fluometuron concentration causing 50% growth inhibition of *L. perpusilla* was about 25 to 35 times higher than that of the 3 other herbicides.

75-0898. Buck, W. B. (Toxicol. Sect., Vet. Diagn. Lab., Coll. Vet. Med., Iowa, State Univ., Ames, IA 50010). **Toxic materials and neurologic disease in cattle.** *J. Amer. Vet. Med. Ass. 166(3): 222-226; 1975.* (16 references)

Chemicals that may, under certain conditions, have primary toxic effects on the central nervous system (CNS) of cattle include lead; organophosphate, organochlorine, and carbamate insecticides; nitrofurans; and mercury. Other toxicants have an indirect effect on the CNS by inhibiting the transfer of oxygen of tissues via blood. Nutritional factors may also contribute to neurologic disease. Effects of these toxic factors are reviewed. Organochlorines are generally diffuse CNS stimulants or depressants. Organophosphate and carbamate compounds are acetylcholinesterase inhibitors, affecting both peripheral nerves and the CNS as well as myoneural junctions. Diagnosis may be based on clinical signs, chemical analysis, and history of exposure. There is no antidote for chlorinated hydrocarbon insecticide intoxication in cattle; removal of contaminating material and symptomatic treatment are advised. Conbinations of atropine and oximes are used in organophosphate poisoning, but oximes are contraindicated in carbamate insecticide poisoning. Consumption of dressed seed grain may produce mercury posioning in cattle. Symptomatic treatment, including dietary adaptation to renal function, may be more beneficial than antidote therapy for mercury poisoning.

75-0899. Doi, E. (Res. Inst. Food Sci., Kyoto Univ., Uji, Kyoto 611, Japan). **Stabilization of pig kidney cathepsin A by sucrose and chloride ion, and inhibition of the enzyme activity by diisopropyl fluorophosphate and sulfhydryl reagents.** *J. Biochem. (Tokyo) 75(4): 881-887; 1974.* (29 references)

Cathepsin A, the enzyme which hydrolyzes car-

bobenzoxy-*L*-glutamyl-*L*-tyrosine, was obtained from pig kidney. The enzyme was labile after dialysis. However, addition of both sucrose and potassium chloride to the dialyzed enzyme protected it from inactivation. The copresence of sucrose (0.5*M*) and KCl (0.1*M*) was required for maximum stability of the enzyme at 37°C pH 7.2. Sucrose was replaceable by other sugar alcohols. The enzyme was stabilized specifically by chloride anion. Acetate ion had no effect, but sulfate, phosphate, and citrate ions reduced the stability. In the presence of both sucrose and KCl, the optimum pH of the activity was between 3 and 5, indicating that the narrow pH range known for cathepsin A may be due to the instability of the enzyme in other pH regions. Cathepsin A is relatively insensitive to sulfhydryl reagents but is inhibited by them in the presence of high concentrations of the reagents and after long incubation periods with them. Enzyme which had been inhibited by PCMB (*p*-chloromercuribenzoic acid) showed restored activity after incubation with cysteine. The activity of the crude enzyme was completely inhibited by DFP (diisopropyl fluorophosphate) in the presence of $10^{-3}M$ EDTA, but it was not inhibited by DFP with cobaltous ion. All this data suggests that cathepsin A and catheptic carboxypeptidase are the same enzyme.

75-0900. Nakamura, A.; Minakami, S. (Dept. Biochem., Kyushu Univ. Sch. Med., Fukuoka, Japan). **Synthesis of catalase in liver slices from aminotriazole-pretreated rats.** *J. Biochem. (Tokyo) 75(6): 1373-1375; 1974.* (10 references)

A male Wistar rat was given aminotriazole (100 mg/100 g, i.p.). Two hours later catalase activity in the liver was assayed and found to have increased about 2-fold. On the other hand, the activity in the liver homogenate remained unchanged during incubation, even in the presence of ethanol, suggesting that the recovery of activity in the liver slices may represent new synthesis of catalase in the liver and not merely a recovery of the activity due to ethanol. A concentration of 0.01 *M* ethanol was required in the incubation medium to obtain a sufficient increase of catalase activity in the slices. The net increase of catalase activity in liver slices was reduced by about 30% in the absence of ethanol, probably due to the formation of inactive catalase complex II and the inhibition of catalase by aminotriazole remaining in the liver slices during incubation. The net increase of catalase calculated from the activity was about 15 μg/g of liver slice during 6 hr incubation. When the liver slices were incubated with cycloheximide or allylisopropylacetamide, the increase of activity was inhibited to about 30%. The inability of these inhibitors to completely stop the increase of activity was probably due to insufficient penetration of the slices by the inhibitor. Liver slices from rats pretreated with actinomycin D or allylisopropylacetamide showed no increase in catalase activity during incubation. It is suggested that the net increase of catalase activity in the liver slices results from the *de novo* synthesis of catalase protein.

75-0901. Greselin, E.; Herr, F. (Ayerst Res. Lab., Montreal, Quebec, Canada H3C 3JF). **Further toxicity studies with antimycin, a fish eradicant.** *J. Agr. Food Chem. 22(6): 996-998; 1974.* (5 references)

Further toxicological studies on antimycin (Fintrol) are presented. Previously reported acute toxicity studies indicated that antimycin has a very low toxicity for mammals and chronic toxicity did not reveal any deleterious effects. These additional studies were designated to determine whether antimycin-treated waters and antimycin-killed fish contained toxic degradation products. Antimycin-treated water was given to dogs and rats as the sole source of drinking water and antimycin-killed fish were administered to dogs and rats as one-half of their diet. Both tests lasted 3 months. In both studies no toxic effects were noticed in the animals which drank the treated water or which ate fish killed by antimycin. A decrease in food consumption was observed in a few dogs and rats at the beginning of the test. It was not considered a toxic manifestation but it was clearly the reaction of the animals to the bitter taste of the compound. (Author abstract reprinted by permission of the American Chemical Society)

75-0902. Strang, R. H.; Rogers, R. L.* (Plant Pathol. Dep., Louisiana State Univ., Baton Rouge, LA 70803). **Behavior and fate of two phenylpyridazinone herbicides in cotton, corn, and soybean.** *J. Agr. Food Chem. 22(6): 1119-1125; 1974.* (17 references)

The absorption, translocation, and metabolism of [^{14}C]SAN 6706 [4-chloro-5-(dimethylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone] and [^{14}C]SAN 9789 (norflurazone) [4-chloro-5-(methylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone] by cotton (*Gossypium hirsutum* L. "Coker 203"), corn (*Zea mays* L. "WF 9"), and soybean [*Glycine max* (L.) Merr. "Lee"] were investigated. Differences in absorption and translocation appeared to be major factors determining the tolerance of plants to SAN 6706 and SAN 9789. Autoradiographic and combustion analyses indicated that most of the radioactivity absorbed by cotton (tolerant) was retained in the roots while significantly more radioactivity was translocated into the shoots of soybean (susceptible) and corn (very susceptible). Tolerant cotton mediated only limited breakdown of the herbicides while the susceptible species rapidly degraded them by the process of *N*-demethylation. The rapid degradation of SAN 6706 by corn and soybean did not represent a detoxification mechanism since the primary degradation product formed (i.e., SAN 9789) was more phytotoxic than SAN 6706. (Author abstract reprinted by permission of the American Chemical Society)

75-0903. Kern, A. D. (Michigan State Univ., East Lansing, MI 48823). **Selectivity of cyanazine (2-[[4-chloro-6-(ethylamino)-*s*-triazin-2-yl]amino]-2-methylpropionitrile) on fall panicum (*Panicum dichotomiflorum* Michx.), green foxtail (*Setaria viridis* L.), and corn (*Zea mays* L.).** *Diss. Abstr. Int. 35(6): 2543B-2544B; 1974.*

The response of corn and fall panicum to post-emergence herbicide applications at three stages of growth was examined. Greenhouse studies indicated that root absorption after post emergence application of cyanazine enhanced phytotoxicity to fall panicum, green foxtail, and corn. The rapid cyanazine metabolism occurring in corn roots was unable to completely eliminate the large amounts absorbed. Five days after foliar application of cyanazine, 32.5 and 41.1% of a water-soluble metabolite were found in fall panicum and green foxtail, respectively. In corn two metabolites accounting for 19.1 and 25.7% of ^{14}C-activity were found in the water-soluble fraction. Only 12.0 and 6.2% of the same breakdown products were found in corn after a single day of treatment. Small quantities of other metabolites were also found. Metabolism of root-applied cyanazine appears to differ from foliar treatments in the weedy grasses as more parent cyanazine was recovered. Green foxtail had equal amounts of unaltered cyanazine present in the shoot and root portions. The roots of corn and fall panicum contained less cyanazine than did the shoots. Rapid metabolism of cyanazine by corn roots provided evidence for an active detoxification mechanism. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-27,432.)

75-0904. Rip, J. W. (Purdue Univ., Lafayette, IN 46205). **Auxin-herbicide induced changes in the biochemistry of livers of Long-Evans rats.** *Diss. Abstr. Int. 35(6): 2626B-2627B; 1974.*

2,4,5-T, fed at 10 mg/70 g animal daily for 2-7 days, did not affect weight gain. The herbicide causes liver enlargement, but the kidneys and spleen are not affected. The liver weight increase is dose-dependent. Enlargement of the liver is nearly reversible upon removal of the herbicide from the diet. Liver glucose-6-phosphatase activity was inhibited 30% while sodium β-glycerophosphatase (acid phosphatase) activity was not increased after feeding 2,4,5-T. Liver enlargement was associated with substantial increases in total liver RNA and total protein, although the RNA content (as well as the DNA content) per gram fresh liver was reduced. Total liver DNA content was unchanged. This data suggests that liver enlargement is due to cellular hypertrophy not restricted to any particular subcellular fraction, rather than the result of increased cell division. 2,4,5-T induced the synthesis of polyribosomal material. Livers from animals fed 2,4,5-T (10 mg daily for 3 or 6 days) contained 144.5 ± 27.9 and 265.5 ± 23.5 g of the chemical per gram fresh liver respectively (apparently as parent compound) when sacrificed 24 hr after the final feeding. A small amount of the total cellular radioactivity from injected 2,^{14}C-2,4-D was associated with purified liver nuclei. The effects of 2,4,5-T seem similar to those of chlorophenoxyisobutyrate, used in treatment of hypercholesterolemia. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-26,770.)

75-0905. Nazer, I. K. (Univ. California, Davis, CA 95616). **Protection of honey bees with oxime drugs from pesticide poisoning.** *Diss. Abstr. Int. 35(6): 2799B; 1974.*

Acetylcholinesterase (AChE) concentrations in the brains of foraging age bees were only about half as high as those in hive bees, and therefore the former were more susceptible to organophosphate intoxication. When pralidoxime was applied prophylactically, 27% mortality protection was achieved against parathion poisoning, 31% against paraoxon poisoning, 29% against malathion poisoning, and 24% against malaoxon poisoning. Results with diacetylmonoxime were in the same range. Maximum prophylactic effects of the oximes were found within 24 hr after ingestion, and these decreased rapidly within 48 hr. No protection was attained by therapeutic administration of pralidoxime or DAM in parathion, paraoxon, malathion, or malaoxon poisoning. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-29,329.)

75-0906. Maki, A. W. (Michigan State Univ., East Lansing, MI 48823). **The effects and fate of lampricide (TFM: 3-trifluoromethyl-4-nitrophenol) in model stream communities.** *Diss. Abstr. Int. 35(6): 2873B; 1974.*

The effects of TFM lampricide on the structure and function of benthic communities were studied in a series of six replicated indoor model streams. A specially developed stream respirometry system was used for measurements of net primary production and community respiration in pool and riffle communities. Pretreatment levels of gross primary production were suppressed by 25-50% during exposure to 9.0 mg/l TFM. Community respiration was increased 3-50% by TFM treatment. No effects of lampricide could be demonstrated on periphyton community structure. A statistically significant decrease in the total number of macroinvertebrates per unit area was demonstrated following treatment. Complete recovery to pretreatment densities was seen in 2-3 months, primarily through drift input. No significant difference in mean growth rates of treated and control brown trout was seen. The uptake of TFM residues was demonstrated, using ^{14}C-TFM, to be basically an adsorption process. Uptake was rapid during the first 2 hr of the exposure. Macroinvertebrate species with soft integument accumulated significantly higher residue concentrations than species with hard chitinous

or calcareous exoskeletons. TFM declines were correlated with water current and substrate associations. The mean half-life for riffle species was 17.8 hr and for pool-dwelling species was 140 hr. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-27,444.)

75-0907. Munnecke, D. M. (Univ. California, Davis, CA 95616). **Microbial detoxificaton of concentrated parathion.** *Diss. Abstr. Int. 35(6): 2909B; 1974.*

Microbial degradation of pesticide wastes may represent a practical disposal method. An adapted mixed culture of predominantly pseudomonad bacteria could detoxify parathion with complete metabolism of its aromatic moiety. The mixed culture could degrade parathion at concentrations up to 10,000 mg/l without signs of chemical toxicity but no individual isolate from this mixed culture could do so. Microbial hydrolysis was faster (50 mg/l/hr) and more complete (no *p*-nitrophenol) than chemical hydrolysis. A stable parathion-hydrolyzing enzyme in the bacterial cell homogenate could theoretically produce *p*-nitrophenol at a rate of 90 g/l/hr/mg homogenate. If this enzymatic hydrolysis of parathion was coupled with *p*-nitrophenol metabolism by a mixed culture, 350 mg/l/hr *p*-nitrophenol could be completely metabolized to CO_2 and cell mass. The bacteria first hydrolyzed parathion to *p*-nitrophenol and diethylthiophosphoric acid; then *p*-nitrophenol was hydrolyzed to hydroquinone which subsequently led to an ortho ring cleavage compound. Under low oxygen conditions, parathion was reduce; to aminoparathion which was hydrolyzed to *p*-aminophenol. The metabolism of parathion emulsifiable concentrate was more complex: the xylene isomers present were metabolized via the toluic acids, which accumulated in the cell broth and inhibited the hydrolysis of parathion. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-29,328.)

75-0908. Fisher, N. S. (State Univ. New York, Stony Brook, NY 11790). **Effects of chlorinated hydrocarbon pollutants on growth of marine phytoplankton in culture.** *Diss. Abstr. Int. 35(6): 2917B; 1974.*

Six species of marine planktonic algae were subjected to various concentrations of polychlorinated biphenyls (PCB) and DDT to determine whether their growth in pure culture was affected by these compounds. Only *Dunaliella tertiolecta*, a green alga, was entirely resistant to the chlorinated hydrocarbons, with the other species showing varying degrees of sensitivity to environmentally relevant organochlorine concentrations. Intraspecific differences in sensitivity to PCB were also noted among three species of diatoms, with the estuarine clones always showing greater resistance than oceanic clones. PCB toxicity to the diatoms *Thalassiosira pseudonana* and *Rhizosolenia setigera* was found to interact with the environmental temperature, with sensitivity increasing as the temperature tolerance limits of these species were approached. Competitive advantage in culture went to that species with the greatest rate of resource exploitation. Due to the impermanence of conditions in aquatic environments and to the relatively low phytoplankton cell densities normally occurring in nature, most phytoplankton species would probably adopt this competitive strategy rather than a density-dependent strategy involving such mechanisms as allelochemics. It is suggested that by interfering with the competitive abilities of some phytoplankton, chlorinated hydrocarbons could disrupt successional patterns and alter species composition in algal communities in nature. Animal communities might be indirectly affected as many herbivores graze selectively. An evaluation is made of the applicability of batch and continuous culture toxicity tests to natural ecosystems. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-27,824.)

75-0909. Virgo, B. B. (Univ. British Columbia, Vancouver, British Columbia, Canada). **Physiological and biochemical mechanisms of dieldrin-induced reproductive lesions in the SWV mouse.** *Diss. Abstr. Int. 35(6): 2931B; 1974.*

The effects of dieldrin on the hepatic mixed function oxidase system and on the reproductive processes of SWV female mice were studied. Dieldrin caused dose-related increases of up to 60% in liver mass and 230% in P-450; microsomal protein was increased by 30-35% at all doses. Imipramine hydroxylation was increased by 30% after 8 days of exposure to 20 ppm; *N*-oxidation was concomitantly decreased. In reproduction studies on virgin and diparous mice, mortality occurred only in females fed 20 or 25 ppm dieldrin. Dieldrin had no effect on the number of parous females which bred, fetal mortality, duration of gestation, or parturition. Infertility in 18% of the parous females fed 10-15 ppm and dose-dependent reductions in litter size (max. 17%) resulted from a pre-nidation lesion: 15 ppm decreased the number of bred, nulliparous females with decidua 5 days postcoitum, while 25 ppm decreased the number of decidua per female. Dieldrin caused pre-weaning loss of the entire litter: 31% of the diparous controls lost their litters compared with 47% of those fed 2.5 ppm, 80% of those fed 5 ppm and 100% of those fed $\geq$10 ppm. Pup-killing and pup neglect were directly responsible for mortality of the litters of dams fed $>$5 ppm. These causes did not kill healthy pups but only hastened the deaths of innately inviable pups. The effect thus was not of hormonal origin. (Author abstract by permission, abridged. Copies of the thesis are available from the National Library of Canada at Ottawa.)

75-0910. Coats, J. R. (Univ. Illinois, Urbana-Champaign, IL 61801). **Toxicity and metabolism of**

three methoxychlor analogues with altered aliphatic moieties, and the development of some novel DDT analogues. *Diss. Abstr. Int. 35(7): 3367B-3368B; 1975.*

Three analogues of methoxychlor were investigated for their insect, fish, and mouse toxicities, and metabolism by the housefly, salt marsh caterpillar, mouse, mouse and sheep liver microsomes, and in a model ecosystem. The results were compared to data in the literature for methoxychlor. The isostere dianisylneopentane was proved to be approximately as environmentally stable and resistant to detoxication as methyoxychlor. The chloropropane and nitropropane were proven to be more susceptible to metabolism by individual organisms and to be environmentally less stable than methoxychlor. The metabolic products were identified to be primarily the mono- and bis-phenols of the parent insecticides, the result of *O*-demethylation by mixed function oxidase activity in the organisms; the phenolic products have been reported as the major metabolites of methoxychlor also. A series of novel DDT-type insecticides were synthesized with methoxy, ethoxy, propoxy, butoxy, and methyl groups utilized as the *para* and *para'* aromatic substitutents; the aliphatic moieties most frequently employed were 2-methyl propane, 2-chloro propane, 2,2-dichloro propane, 2,2-dichloro ethane, 2-nitro butane, and propane. Insect toxicity data is presented for the new compounds, with some limited mouse and fish toxicity data. Design principles are discussed for the development of selective, persistent yet biodegradable insecticides. (Author abstract by permission. Copies of the thesis are available from University Microfilms, Order No. 75-281.)

75-0911. Walsh, A. H. (Univ. Wisconsin, Madison, WI 53706). **The pathology of pesticide poisoning in fish.** *Diss. Abstr. Int. 35(7): 3423B; 1975.*

The production of lesions in coho salmon and lake trout following their exposure to each of seven pesticides was investigated in order to determine if knowledge of such lesions would be valuable diagnostically. Fish were maintained for 7-79 days (mean ca. 30 days) in water containing the level of DDT, carbaryl, malathion, endosulfan, dieldrin, 2,4-D, or atrazine calculated to kill in 30 days. Only carbaryl, 2,4-D, and atrazine produced ultrastructural changes of diagnostic value. Carbaryl caused degenerative changes of muscle and fat and vacuoles within the optic tectum and lateral geniculate body. Irregular black areas appeared in the skin of the dorsal fin shortly before the death of carbaryl exposed fish. Extreme congestion of blood vessels in the brain, especially in the medulla oblongata, was seen in 2,4-D exposed fish; similar findings have been reported in the literature. Atrazine exposed fish changed color several days before dying. Coho salmon became iridescent green and lake trout black. Edema and ascites were also observed in several fish of each species following atrazine exposure. Any of these pesticides would seldom reach natural waterways at concentrations sufficient to kill fish. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 74-19,588.)

75-0912. Benya, T. J. (Univ. Michigan, Ann Arbor, MI 48104). **Warfarin studies.** *Diss. Abstr. Int. 35(7): 3423B; 1975.*

Measurement of plasma and tissue concentrations of warfarin in the rat as a function of time yielded data that might be interpreted in terms of a two compartment open model with the measured tissues being part of the central compartment. A steady state of distribution is achieved between plasma and liver, lung, heart, brain, and spleen tissues within a few minutes after warfarin injection; individual tissue levels and plasma levels within this group of tissues are always directly proportional. Studies of binding of warfarin to rat liver microsomes using a dialysis system and a classical batch binding test indicated that there are two types of binding of warfarin to rat liver microsomes: a saturable component which is important at very low concentrations, and a linear component at higher concentrations. An attempt to resolve some of the experimental difficulties revealed that exposure of warfarin to air and light caused structural changes in the warfarin molecule that were reflected in changes in the ultraviolet spectrum and changes in *Rf* values and tailing on thin layer chromatographic plates. (Author abstract by permission, abridged. Copies of the thesis are available from University Microfilms, Order No. 65-631.)

75-0913. Levac, L. D. (McGill Univ., Montreal, Quebec, Canada). **Degradation of the phenylcarbamate insecticide Elocron by a soil pseudomonad.** *Diss. Abstr. Int. 35(7): 3472B; 1975.*

A pesticide spray program on an agricultural soil suggested that the soil microflora increased upon application of the insecticide Elocron. *Pseudomonas* sp Mac 265, which was isolated from this soil, was shown to metabolize 1500 μg/ml of Elocton as sole carbon source in a minimal medium. The rate of degradation was shown to increase with a rise in temperature and pH. Studies with radioactive Elocron indicated that 85 per cent of the radioactivity was evolved as radioactive CO_2. No degradation product was detected by gas liquid chromatography or thin layer chromatography. Kinetic studies showed that chemical hydrolysis in a defined medium was a first order reaction. The hydrolysis products were identified as salicylaldehyde, methylamine, and ethyleneglycol. The oxidation of the chemical breakdown products was demonstrated, as well as the presence of key enzymes involved in the metabolism of these compounds when grown on Elecron or the specific products, and also the absence of these enzymes in the presence of repressors and non-inducing substrates. These are catechol oxygenase for salicylaldehyde, glycolate oxidase, isocitrate lyase, and malate synthase

for ethyleneglycol, and dimethylamine oxygenase for methylamine. A metabolic pathway involving an initial chemical hydrolysis of the *N*-methylcarbamic side-chain of the pesticide with immediate utilization of the breakdown products by *Pseudomonas* sp Mac 265 is proposed. (Author abstract by permission. Copies of the thesis are available from the National Library of Canada at Ottawa.)

75-0914. Kasang, G.; Weiss, NN. (Max-Planck-Inst. Biochem., Martinsried bei Muenchen, Munich, Germany). **Duennschichtchromatographische Analyse radioaktiv markierter Insektenpheromone. Metaboliten des [^{3}H]Bombykols. [Thin-layer chromatographic analysis of radioactively labeled insect pheromones. Metabolites of [^{3}H]bombykol.]** *J. Chromatogr. 92(2): 401-417; 1974.* (30 references) (German)

Highly labeled [^{3}H]bombykol is extensively metabolized on the antennae of the silkmoth *Bombyx mori* into free fatty acids and fatty acid esters. The metabolites of the acid fraction consist of one long-chain unsaturated fatty acid of the type of 10-*trans*, 12-*cis*-hexadecadienoic acid (ca. 90%) and of one short-chain unidentified fatty acid (ca. 10%). The neutral fraction in addition to unchanged [^{3}H]bombykol contains at least six long-chain ^{3}H-labeled fatty acid esters. (Author abstract by permission)

75-0915. Miller, R. W.; Long, P. P. (Chem. Biophys. Control Lab., Agr. Environ. Qual. Inst., Agr. Res. Serv., U.S. Dept. Agr., Beltsville, MD 20705). **Effect of feeding coumaphos on feed intake and rate of gain of steers.** *J. Dairy Sci. 57(6): 723-725; 1974.* (12 references)

When four Holstein steers were fed a ration containing 3 mg/kg body weight coumaphos for 135 days, blood cholinesterase activity was depressed markedly. However, differences in feed intake, feed conversion, and gain in body weight were not significant between these and four steers fed untreated ration. (Author abstract by permission)

75-0916. Reinert, R. E.; Stone, L. J.; Willford, W. A. (Great Lakes Fishery Lab., Ann Arbor, MI 48107). **Effect of temperature on accumulation of methylmercuric chloride and *p,p'*-DDT by rainbow trout (*Salmo gairdneri*).** *J. Fish. Res. Bd. Can. 31(10): 1649-1652; 1974.* (10 references)

Amounts of mercury and DDT residues accumulated from water by yearling rainbow trout (*Salmo gairdneri*) in the laboratory increased as water temperature increased. Fish exposed to methylmercuric chloride at concentrations of 234–263 ppt for 12 wk at 5, 10, and 15°C accumulated 1.19, 1.71, and 1.96 ppm; fish exposed to *p,p'*-DDT at concentrations of 133-176 ppt accumulated 3.76, 5.93, and 6.82 ppm. Concentrations of mercury accumulated by the fish were significantly different ($P < 0.001$) at each of the three temperatures, and the concentrations of DDT were significantly different at 5 and 10 and 5 and 15°C. Throughout the period of exposure, the concentration factors (concentration of contaminant in the fish/concentration in water) at each of the three temperatures were far higher for *p,p'*-DDT than for methylmercuric chloride. (Author abstract by permission)

75-0917. Smith, P.; Heath, D.; Kay, J. M. (Dept. Pathol., Univ. Liverpool, Liverpool, England). **The pathogenesis and structure of paraquat-induced pulmonary fibrosis in rats.** *J. Pathol. 114(2): 57-67; 1974.* (14 references)

The histopathology and ultrastructure of the lungs of rats were examined after both acute and chronic administration of paraquat. In acute studies, 18 female Wistar rats received 20-100 mg paraquat ion/kg, i.p. For chronic studies, 15 female Wistar rats received 10 mg paraquat ion/kg on day 1. Surviving animals received further injections on day 23, 39, 60, 86, and 106. Results of the studies indicated that in the development of paraquat lung there is an early stage of pulmonary edema and disintegration of the alveolar epithelium, followed by an infiltration into the alveolar spaces of primitive mesenchymal cells or profibroblasts. These differentiate via intermediate forms into mature fibroblasts. The result is a cellular, intra-alveolar fibrosis with consolidation of the lung. Interstitial fibrosis was encountered only as foci in 2 rats after chronic administration of paraquat. These foci also contained foamy macrophages and a continuous epithelium of granular pneumocytes. The pathogenesis and structure of paraquat-induced pulmonary fibrosis in the rat is at variance with the definition of diffuse fibrosing alveolitis in man.

75-0918. Schafer, E. W., Jr.; Brunton, R. B.; Lockyer, N. F. (Fish and Wildl. Serv., Wildl. Res. Cent., Denver, CO 80225). **Hazards to animals feeding on blackbirds killed with 4-aminopyridine baits.** *J. Wildl. Manage. 38(3): 424-426; 1974.* (3 references)

Red-winged blackbirds (*Agelaius phoeniceus*) killed by ingesting cracked corn baits treated with 3 percent 4-aminopyridine, or by oral doses of 4-aminopyridine, were fed to canines, laboratory rats (*Rattus norvegicus*), black-billed magpies (*Pica pica*), and three species of hawks. The test animals consumed the equivalent of up to 3.4 LD50 doses of 4-aminopyridine in single feedings and up to 3.2 LD50 doses a day for 20 days in repeated feedings. None showed any symptoms of intoxication or gross abnormalities at necropsy. (Author abstract by permission)

75-0919. Schwartz, C. C.; Nagy, J. G. (Chariton Res. Sta., Red Haw State Park, Chariton, IA 50049).

Pesticide effects on in vitro dry matter digestion in deer. *J. Wildl. Manage. 38(3): 531-534; 1974.* (13 references)

Effects of six pesticides, Bordeaux mixture, Mema RM (methoxyethylmercury acetate), toxaphene, DDT, dieldrin, and Sevin (carbaryl) upon digestion of an alfalfa hay substrate in vitro were examined. There was a significant decrease ($P < 0.05$) in digestion of dry matter by both penned and wild deer (*Odocoileus hemionus*) rumen bacteria at a pesticide concentration of 1,000 ppm for all compounds tested except Mema RM with wild deer inoculum. Bordeaux mixture significantly decreased ($P < 0.05$) digestion of dry matter at 100 ppm. There was also a significant difference ($P < 0.05$) between digestion coefficients for control levels (no pesticide) of penned and wild deer. (Author abstract by permission)

75-0920. Akeyama, N.; Kanbayashi, Y.; Murai, S.; Hosoda, K.; Iwamoto, T. (Kakenyaku Kako Co., Ltd., Res. Develop. Project, Tokyo, Japan). **The structures and glucocorticoid-like activities of *s*-triazines (III). Pharmacological activities of metabolites of M1704.** *Jap. J. Pharmacol. 24(Suppl.): 141; 1974.*

The effect of the five primary metabolites of M1704 (2-amino-4(*p*-fluoroanilino)-6-*n*-propyl-1,3,5-triazine) on the biological activity and biosynthesis of corticosteroids was studied. A-2 (2-amino-4-(*p*-fluoroanilino)-6-(1-hydroxy-*n*-propyl)-1,3,5-triazine) showed the strongest activity in terms of liver glycogen deposition. In this respect, A-5 (2-amino-4-(2-hydroxy-4-fluoroanilino)-6-*n*-propyl-1,3,5-triazine) also showed strong activity, while that of A-3 (2-amino-4-(*p*-hydroxyanilino)-6-*n*-propyl-1,3,5-triazine) was weak. Neither A-4 (2-amino-4-(3-hydroxy-4-(3-hydroxy-4-fluoroanilino)-6-*n*-propyl-1,3,5-triazine) nor A-6 (2-amino-4-(2-hydroxy-4-fluoroanilino)-6-(1-hydroxy-*n*-propyl)-1,3,5-triazine) showed any such activity. The metabolites showing strong activity also strongly enhanced liver glycogen deposition with cortisol. The anti-inflammatory actions of the metabolites correlated with the liver glycogen deposition activities.

75-0921. Miura, K.; Ino, T.; Iizuka, S. (Nat. Inst. Anim. Health, Min. Agr. and Forestry, Chiba, Japan). **[Comparison of susceptibilities to the acute toxicity of BHC in strains of experimental mice.]** *Jikken Dobutsu (Exp. Anim.) 2(3): 198; 1974.* (Japanese)

Male mice of five strains, SS, CF-1, AA, C57BL/6, and C3H/He, were fed Oriental Solid Diet and given daily oral doses of BHC at 8000, 4000, 2000, 1000, 500, or 250 mg/kg body weight. The preparation used was technical BHC containing 66.3% α-BHC, 9.4% β-BHC, 15.3% γ-BHC (lindane), and 7.2% δ-BHC. Animals were also fed doses of each isomer corresponding to the amounts in technical BHC. After observing the animals for seven days the LD50 of each preparation was calculated. The LD50 of technical BHC was 411 mg/kg for SS, 500 mg/kg for CF-1, 802 mg/kg for AA, 1414 mg/kg for C57BL/6, and 1459 mg/kg for C3H/He strain mice. A difference was also seen in mortality over time: it was low in the early stages and high in later stages in SS and CF-1 mice, high in the early stages and low in the later stages in AA, C57BL/6, and C3H/He mice. The LD50 of lindane was 340 mg/kg for C3H/He, 550 mg/kg for SS, and 562 mg/kg for CF-1 mice, showing the inverse order to that of technical BHC, and death occurred at an early stage following convulsions.

75-0922. Darwazeh, H. A.; Mulla, M. S. (Dept. Entomol., Univ. California, Riverside, CA 92502). **Toxicity of herbicides and mosquito larvicides to the mosquito fish *Gambusia affinis*.** *Mosquito News 34(2): 214-219; 1974.* (7 references)

Studies were initiated to determine the toxicity of various mosquito larvicides and herbicides to the mosquito fish *Gambusia affinis* and some non-target organisms. No acute mortality of mosquito fish was noted within 48 hr when treated with 6 soil sterilant type herbicides at 10 ppm in the laboratory or within 5 days with 5 lb/A a.i. in the field. In 20-gallon tubs, Abate (biothion) produced no fish kill at 5 ppm within 48 h, while chlorpyrifos, Bay 69047 (*O,O*-dimethyl-*O*-[4-nitro-3-isopropyl-mercaptophenyl]-thionophosphate) and phoxim (*O,O*-diethyl thiophosphoryl-*O*-α-cyanobenzol-doxine) at 5 ppm produced complete mortality. In the field, chlorpyrifos, Bay 77488 and Bay 69047 caused negligible fish mortality at larvicidal rates. At 0.1 lb/A, Akton (*O,O*-diethyl *O*[2-chloro-1-(2,5-dichlorophenyl)vinyl] phosphorothioate) was highly toxic. The toxicity of aliphatic amines to mosquito fish varied according to the type of solvent used. At 1-5 ppm, most formulations were highly toxic in the lab, but no acute toxicity was observed at larvicidal rate (0.25-1.0 lb/A) in the field. Surface breathing insects and water skimming spiders, however, were adversely affected.

75-0923. Elespuru, R.; Lijinsky, W.; Setlow, J. K. (Biol. Div., Oak Ridge Nat. Lab., Oak Ridge, TN 37830). **Nitrosocarbaryl as a potent mutagen of environmental significance.** *Nature (London) 247(5440): 386-387; 1974.* (9 references)

The mutagenicity of nitrosocarbaryl was examined in 2 bacterial systems, *Escherichia coli* and *Haemophilus influenzae*. The mutation rate increased as a function of killing to a loss of about 90% of the cells, after which the mutation frequency leveled off and declined, probably due to killing of mutants. The molar concentration of nitrosocarbaryl required to induce a mutation frequency of 10^{-5} is less than one-fiftieth the concentration of *N*-methyl-*N'*-nitro-*N*-nitrosoguanidine (MNNG) required, and less than 1/10 the concentration of nitrosomethylurethane (NMUr) required to induce a similar level of mutation. The precursor, carbaryl, was not mutagenic. Each of the three compounds tested is an

N-methyl-*N*-nitroso compound. The differences in their potency may be due to differential formation of reactive intermediates within the cell, or to differential uptake of the compounds as governed by the structure of the rest of the molecule. The naphthyl group on nitrosocarbaryl increases its lipid solubility and therefore may be a factor in its biological activity. *E. coli* was less sensitive than *H. influenzae* to both MNNG and nitrosocarbaryl. Nitrosocarbaryl at 0.1 m*M* and MNNG at 1.0 m*M* killed about 50% of the *E. coli* cells after a treatment time of 10 min. The induced mutation frequencies (reversion to prototrophy) for these treatments were 3×10^{-4} and 5×10^{-4}/survivor, respectively. Both killing and mutation were less sensitive functions of mutagen concentration and treatment time in *E. coli* than in *H. influenzae*. Nitrosocarbaryl is a potent mutagen and is a possible hazard to man as its precursors carbaryl and nitrite are both common environmental constituents which are consumed (carbaryl as a crop residue and nitrite as a food additive), and the stomach provides the acidic conditions for its formation. *N*-nitroso compounds act systemically and are more effective as carcinogens when administered in small doses over long periods of time.

75-0924. Schulte-Hermann, R.; Leberl, C.; Landgraf, H.; Koransky, W. (Inst. Toxikol. Pharmakol., Philipps-Univ., Marburg, Germany). **Liver growth and mixed-function oxidase activity: dose-dependent stimulatory and inhibitory effects of α-hexachlorocyclohexane.** *Naunyn-Schmiedeberg's Arch. Pharmacol. 285(4): 355-366; 1974.* (27 references)

α-Hexachlorocyclohexane (α-HCH, α-BHC) elicits liver growth and stimulation of hepatic microsomal mixed-function oxidase. In the present study the extent of these changes was determined in rats 2, 4, and 6 days after treatment with doses of α-HCH ranging from 1 to 600 mg/kg. Above the respective threshold doses, liver mass, liver DNA, and the rate of aminopyrine demethylation increased in proportion to the log dose. Threshold doses were calculated to be 30 mg/kg for the increase of liver weight and DNA and 5 mg/kg for the stimulation of aminopyrine demethylation. Liver mass and liver DNA continued to increase up to the highest dose used; in contrast, the rate of aminopyrine demethylation declined at doses exceeding 200 mg/kg. This decline seems to be due to inhibition by α-HCH retained in the microsomal fraction: α-HCH is a potent, apparently competitive inhibitor of aminopyrine demethylation, and gas chromatographic determination revealed that the amount of α-HCH retained in the microsomes is sufficient to produce considerable inhibition of the enzymatic reaction. (Author abstract by permission)

75-0925. Gellert, R. J.; Heinrichs, W. L.; Swerdloff, R. (Univ. Washington Sch. Med., Seattle, WA 98105). **Effect of neonatally-administered DDT homologs on reproductive function in male and female rats.** *Neuroendocrinology 16(2): 84-98; 1974.* (26 references)

The ability of homologs of DDT to alter neuroendocrine differentiation was investigated in neonatal male and female Sprague-Dawley rats. The estrogenic isomer TDE produced precocious puberty with an inverse relation between age at vaginal opening and dose of DDT. The minimum effective dose for inducing persistent vaginal estrus and anovulation was 0.1 mg TDE on day 2, 3, and 4 of life. As the dosage was increased, the syndrome appeared earlier in life. Uterine histology in adult rats treated as neonates with high doses of TDE was markedly changed, i.e., patches of stratified squamous epithelium were evident. The feedback rise in serum gonadotropin concentration in response to ovariectomy was reduced in rats treated with high doses of TDE neonatally when compared to vehicle-treated controls. Uterine histology and gonadotropin data suggest that neonatal exposure may also permanently affect the sensitivity of the hypothalamic-hypophyseal axis and the uterus to endogenous estrogen. Male rats treated as neonates with high doses of DDT homologs had normal reproductive organ weights and motile sperm as adults in spite of the known estrogenic activity of some of the compounds. It was concluded that TDE given to newborn female rats may, in a dose-dependent fashion, permanently alter neuroendocrine differentiation, but that male rats are unaffected.

75-0926. Hammock, B. D.; Gill, S. S.; Casida, J. E. (Div. Entomol. Parasitol., Univ. California, Berkeley, CA 94720). **Insect metabolism of a phenyl epoxygeranyl ether juvenoid and related compounds.** *Pestic. Biochem. Physiol. 4(4): 393-406; 1974.* (17 references)

1-(4′-Ethylphenoxy)-3,7-dimethyl-6,7-epoxy-*trans*-2-octene (the ethyl-epoxide), a potent insect morphogenetic agent, is converted to 6,7-diol and other derivatives in living cockroaches and mealworms. Enzyme preparations of these organisms, and of houseflies and several other insect species, also carry out these hydration and/or oxidation reactions. In addition, housefly microsomes epoxidize the ethyl-epoxide to a diepoxide. The diepoxide and diol are then converted by microsomes to at least 6 cyclic diols, probably via an epoxy-diol intermediate, the major ones being the *cis*- and *trans*-tetrahydrofuran-diol derivatives. The metabolites formed by these reactions have little or no morphogenetic activity in *Tenebrio* assays. Attempts to find potent inhibitors for housefly epoxide hydratases were unsuccessful. The corresponding ethylphenyl geranyl ether is epoxidized by housefly microsomes, forming the more morphogenetically active ethyl-epoxide, but the major reaction is oxidation on the geranyl moiety to an unidentified olefinic carboxylic acid. The chemical modifications needed for improved stability and morphogenetic activity in this juvenoid series depend on the insect species and strain and the relative activities of their enzymes involved in various inactivation pathways.

75-0927. Tseng, Y. C. L.; Menzer, R. E. (Dept. Entomol., Univ. Maryland, College Park, MD 20742). **Effect of hepatic enzyme inducers on the in vivo and in vitro metabolism of dicrotophos, dimethoate, and phosphamidon in mice.** *Pestic. Biochem. Physiol. 4(4): 425-437; 1974.* (36 references)

Phenobarbital (75 mg/kg/day, i.p., for 3 days) or dieldrin (25 ppm in the diet for 14 days) caused increases in liver cytochrome P-450 and blood B-esterase. Liver A-esterase was not significantly increased. Under in vitro conditions, phenobarbital and dieldrin induced the oxidative as well as hydrolytic metabolism of dicrotophos, dimethoate, and phosphamidon by liver homogenates or combined microsomes plus 105,000 g supernatant fractions. Dimethoxon concentration was increased more than 4-fold by pretreatments after incubation for 4 hr at 37.5°C with NADPH added. The organophosphorus insecticides used were not metabolized as well by the liver microsomes alone or 105,000 g supernatant alone, as by the combination of microsomes and 105,000 g supernatant. Under in vivo conditions in mice, phenobarbital and dieldrin treatments increased the urinary recovery of metabolites in the initial 6 hr after ^{14}C-carbonyl-dimethoate or ^{14}C-*N*-ethyl-phosphamidon administration. Urine analysis showed that the inducers caused more than a 6-fold increase in dimethoxon recovered and a 2-fold increase in water-soluble nontoxic metabolites within 6 hr after dimethoate administration. With phosphamidon, both inducers increased the metabolism rate, and the total recovery in aqueous and chloroform fractions was decreased. These results suggest that increased dimethoate toxicity after phenobarbital and dieldrin treatments in whole animals results from stimulation of the activation of dimethoate to dimethoxon, while the increase in hydrolytic products after both pretreatments results in decreased toxicity of the direct acetylcholinesterase inhibitors, dicrotophos and phosphamidon.

75-0928. Miyamoto, J.; Suzuki, T.; Nakae, C. (Res. Dept., Pesticides Div., Sumitomo Chem. Co., Hyogo, Japan). **Metabolism of phenothrin or 3-phenoxybenzyl *d-trans*-chrysanthemumate in mammals.** *Pestic. Biochem. Physiol. 4(4): 438-450; 1974.* (13 references)

Carbon-14 *d-trans*-phenothrin or 3-phenoxybenzyl *d-trans*-chrysanthemumate labeled at the hydroxymethyl group in the alcoholic moiety was administered to male Sprague-Dawley rats (200 mg/kg, p.o.). Rapid absorbtion occurred from the gastrointestinal tract and the compound was distributed into various tissues. Radioactivity was rapidly eliminated over a 3 day period via the urine (about 60%) and feces (about 40%). No detectable radioactive carbon dioxide was expired. The predominant urinary and fecal metabolite was 3-(4′-hydroxy)phenoxybenzoic acid which amounted to about 55% of the recovered radioactivity. Also identified was 3-phenoxybenzoic acid, both free and conjugated with glycine. In vitro studies using liver preparations from rats, guinea pigs, mice, rabbits, and dogs showed that *d-trans*-phenothrin was hydrolyzed to 3-phenoxybenzyl alcohol, which was subsequently oxidized. The *l-trans* isomer was also easily hydrolyzed, whereas *d-cis*- and *l-cis*-phenothrin were resistant to hydrolytic attack at the ester linkage.

75-0929. Krupka, R. M. (Res. Inst., Res. Branch, Agr. Canada, London, Ontario, Canada). **On the anticholinesterase activity of benomyl.** *Pestic. Sci. 5(2): 211-216; 1974.* (5 references)

The fungicide benomyl, previously reported to be an anti-cholinesterase and toxic to earthworms, has now been shown to have little or no effect on cholinesterase. However, it breaks down to form two products: butyl isocyanate, which is an irreversible inhibitor of the enzyme of comparable potency to organophosphates; and methyl benzimidazol-2-ylcarbamate (MBC, carbendazim), which does not inhibit it at all. The reported inhibitory power of benomyl is therefore likely to be due to formation of small quantities of the former. It is also concluded that toxicity of benomyl and MBC to earthworms cannot be due to inactivation of cholinesterase. (Author abstract by permission)

75-0930. Smith, M. S.; Weeraratna, S. (Wye College, Univ. London, Ashford, Kent, England). **The influence of some biologically active compounds on microbial activity and on the availability of plant nutrients in soils. I. Simazine, ioxynil and 2,3,6-TBA.** *Pestic. Sci. 5: 721-729; 1974.* (20 references)

The effect of the herbicides simazine (2-chloro-4,6-bis(ethylamino)-*s*-triazine, ioxynil (4-hydroxy-3,5-diiodobenzonitrile) and 2,3,6-TBA(2,3,6-trichlorobenzoic acid) on microbial activity and available plant nutrient content of an acid and an alkaline soil during an incubation period of six weeks under aerobic conditions has been studied in comparison with untreated soils. The herbicides were incorporated with the soils at normal application rates. At intervals determinations were made of carbon dioxide liberated, the content of ammonium and nitrate nitrogen and of available mineral plant nutrient elements. These quantities were not significantly influenced by the presence of 2,3,6-TBBA; simazine stimulated microbial activity and ioxynil did so after an initial period of suppression. Both simazine and ioxynil retarded nitrification in the alkaline soil but increased it in the acid soil, attributed in part to stimulation of heterotrophic organisms. Biological oxidation of manganese was retarded by ioxynil but stimulated by simazine. Changes in the availability of some other plant nutrient elements were also found. (Author abstract by permission)

75-0931. Freitag, K. D.; Bock, R. (Inst. Anorg. Chem. Kernchem., Johannes Gutenberg-Univ., Mainz, Germany). **Degradation of triphenyltin chloride on sugar beet plants and in rats.** *Pestic. Sci. 5: 731-739; 1974.* (8 references)

The degradation of triphenyltin chloride on the leaves of sugar beet proceeds via di- and mono-phenyltin compounds to inorganic tin(IV). This degradation scheme has also been observed in rats, as the same metabolites were found in urine and feces of these animals. After a single application of triphenyltin chloride, more than 90% of the tin given is excreted within one week (approx. 88% with the feces and approx. 3% with the urine). The experiments were performed with radioactive $(C_6H_5)_3{}^{113}SnCl$. (Author abstract by permission)

75-0932. Matin, M. A.; Kar, P. P. (Ind. Toxicol. Res. Cent., Chattar Manzil Palace, Lucknow, U.P., India). **Effect of barbiturates and isoniazid on cerebral hemisphere γ-aminobutyric acid content in *p,p'*-DDT treated mice.** *Pharmacol. Res. Commun. 6(4): 357-362; 1974.* (15 references)

p,p'-DDT (60 mg/100 g body weight) in peanut oil was administered orally to adult male white mice. Three hours later, some of the animals were given phenobarbitone sodium (50 mg/kg, i.p.), and 4 hours later others were given prominal sodium, primidone sodium, or isoniazid (50 mg/kg, i.p.). The animals were killed 5 hours after DDT treatment. The DDT treated mice showed symptoms such as hyperexcitability and tremors after 2-3 hours, and convulsions after 4-5 hours. Phenobarbitone sodium protected the animals against the DDT-induced tremors and convulsions, while prominal sodium protected 52% of the mice. Primidone had no protective effect, and isoniazid intensified the DDT-induced convulsions, leading to death in some cases. DDT alone lowered the levels of γ-aminobutyric acid (GABA) in the cerebral hemispheres. Phenobarbitone and, to a lesser extent, prominal, increased the GABA content in the DDT-treated mice. Primidone had no effect on the GABA level, while isoniazid significantly lowered the GABA level beyond the reduction effected by DDT. The DDT-induced reduction in cerebral GABA may contribute to the convulsions caused by the insecticides.

75-0933. Stevens, J. T. (Dept. Pharmacol., Milton S. Hershey Med. Cent., Pennsylvania State Univ. Coll. Med., Hershey, PA). **Effect of malathion on hepatic microsomal metabolism of the male mouse.** *Pharmacology 11: 330-335; 1974.* (14 references)

Liver microsomal preparations obtained from adult male Swiss-Webster mice were incubated with a NADPH generating system and malathion. Malathion was a more potent inhibitor of ethylmorphine and hexobarbital than aniline or glucose-6-phosphate dehydrogenase in this system. Malathion bound to both the oxidized and reduced forms of cytochrome P-450. In the ferric state, cytochrome P-450 binds to malathion exhibiting a typical type I spectrum; binding to the ferrous form of cytochrome P-450 resulted in the production of an unusual spectrum with a peak at 421 nm and a trough at 444 nm. Although the Δ-*A* max values were similar, the binding affinity of malathion was much stronger for the oxidized than the reduced form of P-450. In vivo, malathion inhibited the *N*-demethylation of ethylmorphine, but increased the rate of NADPH oxidation and the activity of glucose-6-phosphate dehydrogenase. It also significantly reduced the cytochrome P-450 content without affecting the level of cytochrome-*c* reduction. Thus, the binding of malathion to cytochrome P-450 may be related to the compound's ability to inhibit the metabolism of type I substrates by the P-450 system.

75-0934. Hulin, N.; Horowitz, M. (Div. Weed Res., ARO, Newe Ya'ar Exp. Sta., Newe Ya'ar, Israel). **Effect of herbicides on nitrification.** *Phytoparasitica 1(1): 64; 1973.*

The effect of bromacil, diphenamid, and prometryne on soil nitrification was studied under laboratory conditions, the nitrification process serving as an indicator of the soil biology and fertility. A clay soil treated with ammonium sulfate (up to 500 ppm) was treated with bromacil (1-1000 ppm), diphenamid (1-40 ppm), and prometryne (1-50 ppm) using commercial formulations as wettable powder. The treated soil was incubated under conditions favoring optimal nitrification. Prometryne caused some inhibition of nitrification at 10 ppm after 2 weeks, but none after 4 weeks even at 50 ppm. Diphenamide inhibited nitrification at 4 ppm after 2 weeks, but not after 4 weeks; at 8 and 40 ppm, the nitrate concentration after 4 weeks was even higher than in the control. Bromacil at 100 ppm also inhibited nitrification after 2 weeks but not after 4 weeks; at 1000 ppm, nitrification was still completely inhibited after 6 weeks.

75-0935. Hulin, N.; Henis, Y.; Horowitz, M. (Div. Weed Res., ARO, Newe Ya'ar Exp. Sta., Newe Ya'ar, Israel). **Microbial degradation of prometryne in soil.** *Phytoparasitica 1(1): 65; 1973.*

Autoclaved and nonsterilized clay soil samples, each treated with prometryne at rates up to 4 ppm, were incubated for 60 days either dry at 4°C or at 75% of field capacity at 30°C. More prometryne remained in the sterilized moist soil than in the nonsterilized soil, indicating that its degradation was mainly microbiological. Bioassays with cucumber using a 1:1 mixture of clay soil and sand treated with prometryne (3.2 ppm) and kept moist showed no phytotoxicity after 47 days. After 30 days incubation, less prometryne remained in soil modified with a 1% solution of glucose or yeast extract than in a nonmodified control. After 40 days

incubation, more prometryne remained in soil to which chloramphenicol (a bacterial inhibitor) had been added than in the control, but there was no significant difference between the control and soil to which cycloheximide (a fungal inhibitor) had been added. Thus prometryne degradation is caused mainly by bacteria. No significant difference was found in the amount of prometryne persisting after one, two, or three applications, at intervals of 40 days between the first and second applications, and of 92 days between the second and third applications.

75-0936. Glasson, B. (Lab. Metab. Med., Fac. Med., Geneva, Switzerland). **Une seconde vie du medicament. [A second life for medicine.]** *Praxis 63: 543-544; 1974.* (French)

General problems of the absorption, excretion, metabolism, and interactions of therapeutic drugs in the human organism are outlined. The metabolism of pesticides, such as organochlorine and organophosphorus compounds, may be activated by such drugs as phenobarbital, phenylbutazone, and tolbutamide. Phenobarbital in particular causes depletion of the pesticides stored in the organism and accelerated urinary excretion of ascorbic acid.

75-0937. Brenner, F. J.; Corson, S. D. W. (Biol. Dept., Grove City Coll., Kansas City, MO). **The effect of insecticides and herbicides on *Azotobacter* in an old field community.** *Proc. Pa. Acad. Sci. 48: 65-67; 1974.* (8 references)

DDT, Marlate, dylox, Metasystox, a mixture of 2,4,5-T and 2,4-D, and a mixture of pentachlorophenol and 2-methoxy-4,6-bis (isopropylamino)-*S*-triazine were applied to experimental plots in an old field community. Compared with the control plots, the number of *Azotobacter* declined in plots sprayed with the chlorinated hydrocarbons and dylox. In all cases, the *Azotobacter* populations gradually increased, reaching near control values within 21 days in the chlorinated hydrocarbon-treated plots, and 66% control values within 28 days in the dylox-treated plots. The 2,4,5-T/2,4-D mixture caused an initial decline in the number of *Azotobacter*, while the other herbicide mixture had no effect. In the 2,4,5-T/2,4-D-treated plots, the bacteria reached control values within 21 days.

75-0938. Marshall, C. D.; Rutschky, C. W., III. (Park Forest Junior High Sch., State College Area Schools, State College, PA 16801). **Single herbicide treatment: effect on the diversity of aquatic insects in Stone Valley Lake, Huntingdon Co., PA.** *Proc. Pa. Acad. Sci. 48: 127-131; 1974.* (20 references)

In June 1973, a granular form of the butoxyethanol ester of 2,4-D was applied to a 4 acre cove (C-E Cove) of Stone Valley Lake in Pennsylvania at a rate of 39 lb acid equivalent per surface acre. The macroinvertebrate fauna of the lake during the study was represented by 21 taxa; the noninsectans included crayfish, water mites, mussels, snails, aquatic annelids, and planaria. The overall diversity in the test area did not change after 2,4-D treatment, although the cumulative number of collected organisms increased immediately after treatment, then decreased; the number of damselflies, in particular, dropped considerably over the summer. The number of midge larvae, horseflies, and aquatic worms increased after treatment. Dissolved oxygen on the bottom of C-E Cove dropped to 0 ppm 6 days after 2,4-D treatment and remained low throughout the summer. The area, which had become heavily infested with weeds, became relatively clear and weed-free, and the total alkalinity and ion concentration increased. 2,4-D had little apparent short-range effect on macroinvertebrate community structure in Stone Valley Lake.

75-0939. Swartz, R. D.; Sidell, R. R. (Biomedical Lab., Edgewood Arsenal, MD 21010). **Renal tubular secretion of pralidoxime in man.** *Proc. Soc. Exp. Biol. Med. 146: 419-424; 1974.* (15 references)

The specific mechanism by which the renal tubule handles pralidoxime, a quaternary ammonium compound used to reactivate organophosphate-inhibited cholinesterase, has been studied using 22 subjects. Each subject was placed under certain conditions in the course of the study. All 22 received pralidoxime (5 mg/kg, i.v., over a 2-min interval) under conditions of forced hydration and bed rest to serve as controls. Eight subjects received pralidoxime under conditions of forced hydration and bed rest, one time after 36 hr of ammonium chloride acidification, and another time after sodium bicarbonate alkalinization. Nine subjects received pralidoxime under forced dehydration and bed rest, 20-30 min after thiamine (200 mg total, i.m.), organic base. Eight received pralidoxime under forced hydration and bed rest simultaneously with *p*-aminohippurate (900 mg total, i.v.), organic acid. Four received pralidoxime under bed rest, after 8-12 hr of fasting, NPO. The drug is rapidly cleared from the plasma by renal tubular secretion. Reduction of pralidoxime clearance rates and prolongation of the biologic half-life after thiamine administration as compared to those after PAH administration suggest that pralidoxime is secreted as an organic base. Reduction of the excretion of pralidoxime under conditions of both urine alkalinization and urine acidification implicates an active reabsorption of pralidoxime not heretofore described.

75-0940. Miller, P. E.; Fink, G. B. (Dept. Pharmacol. Toxicol., Orgeon State Univ., Corvallis, OR). **Brain serotonin level and pentylenetetrazol seizure threshold in dieldrin and endrin treated mice.** *Proc. West. Phar-*

macol. Soc. 16: 195-197; 1973. (7 references)

Dieldrin and endrin (one-half the LD50) were administered orally to male CF1 mice. At various intervals thereafter, pentylenetetrazol was administered, and the seizure thresholds (PST) of the drug determined. A single dose of dieldrin produced a persistent decrease in the PST but no significant effect on the whole brain concentration of 5-hydroxytryptamine (5-HT). A single dose of endrin produced a 72-hour decrease in the PST and a signficant increase in brain 5-HT at 24 hours. Thus, there is no definite correlation between seizure threshold and whole brain 5-HT concentration.

75-0941. Friedman, M. A.; Couch, D. B. (Dept. Pharmacol., Med. Coll. Virginia, Richmond, VA 23219). **Inhibition by piperonyl butoxide of phenobarbital mediated induction of mouse liver microsomal enzyme activity.** *Res. Commun. Chem. Pathol. Pharmacol. 8(3): 515-526; 1974.* (17 references)

Piperonyl butoxide inhibited phenobarbital induction of mouse liver aminopyrine demethylase, a type I enzyme, and aniline hydroxylase, a type II enzyme. When piperonyl butoxide (500 mg/kg) was given daily either 2 and 3 days prior to enzyme determination or 4, 3, and 2 days prior to assay, and phenobarbital (75 mg/kg) administered daily for all 3 or all 4 days, respectively, microsomal enzyme activity did not differ from piperonyl butoxide alone. In similar experiments, piperonyl butoxide inhibited phenobarbital-mediated induction at 1, 2, and 3 days after initiation of daily treatment. This data supports the concept that metabolism of microsomal enzyme inducers is causally related to the process of enzyme induction. Since microsomal enzyme induction is an important adaptive process, impairment of this process may be hazardous to humans exposed to occupational chemicals or environmental pollutants. Although high doses of piperonyl butoxide were used to inhibit induction, this phenomenon may be important due to interaction of piperonyl butoxide with other methylenidioxyphenyl derivatives producing synergistic responses. Further, other environmental inhibitors of microsomal enzyme induction may have potential relevance to development of drug tolerance and facilitation of chemotherapy.

75-0942. Nishimura, M.; Kaneko, Y.; Sakama, H.; Tomita, M.; Yomeya, N.; Ueda, K.; Ogata, S.; Kawamura, A. (Sch. Hyg., Tokyo Dental Coll., Tokyo, Japan). **[Experiments on the toxicity of organophosphorus pesticides to beagles.]** *Sangyo Igaku (Ind. Med.) 16(4): 362; 1974.* (Japanese)

Three beagles were given 20 mg/kg fenitrothion orally daily for a week. After one month they were again given fenitrothion 5 mg/kg/day for 10 months. No significant difference was found in general symptoms, peripheral blood findings, or clinical hemobiochemical factors between treated and untreated dogs. In ophthalmological examination no difference between the two groups was detected in corneal radius of curvature, ophthalmic pressure, pupils, and fundus. Blood ChE activity significantly decreased after one week of fenitrothion treatment and it took 10 days to recover. It took about one month for restoration of normal erythrocyte activity. On the last day of the experiment the residual concentration of fenitrothion in blood was about 0.001 μg/ml in all three treated dogs (determined by FPD-gas chromatography). However, a peak coinciding with the fenitrothion peak in *Rf* has been found in the gas chromatograph of blood from persons who have never been exposed to organophosphorus pesticides, and the detection of their residues must therefore be regarded with some skepticism.

75-0943. Hori, S.; Kashimoto, T. (Osaka Prefect. Inst. Pub. Health, Osaka, Japan). **[Transfer of beta-BHC from mother to suckling mouse.]** *Shokuhin Eiseigaku Zasshi (J. Food Hyg. Soc. Jap.) 15(6): 446-450; 1974.* (3 references) (Japanese)

Beta-BHC (50 μg/day) and PCB (the same amount), singly or as a mixture, were administered orally in an olive oil solution to pregnant mice from the 10th day of pregnancy to the day before delivery; daily for 21 days after delivery; or from the 10th day before pregnancy to the 21st day after delivery. ^{14}C-β-BHC was added to the β-BHC at a rate of 0.8%. The accumulation of radioactivity in the mother and the transfer to fetuses or suckling mice were examined. Whether or not PCB was administered, 33.2-53.7% of the ^{14}C-β-BHC administered within 10 days remained in the pregnant mouse and 1.6-2.2% in the fetus. Little of the ^{14}C-β-BHC administered after delivery remained in the mothers while 60.0-63.8% of the total remained in sucklings, also regardless of PCB. It was concluded that placental transfer of β-BHC is negligible, and the accumulated β-BHC in the mother and that administered to the mother after delivery were rapidly transfered to the sucklings.

75-0944. Colvin, H. W.; Wang, W. L. (Dept. Anim. Physiol., Univ. California, Davis, CA 95616). **Toxic effects of warfarin in rats fed different diets.** *Toxicol. Appl. Pharmacol. 28(3): 337-348; 1974.* (31 references)

Toxic doses of warfarin were administered (0.8 mg/kg p.o.) daily for 5 days to one group of rats (250-300 g) fed oat groats and to another fed Purina laboratory chow. Five rats from each dietary group were sacrificed at 5, 29, 53, 77, and 101 hr after the initial dose. The plasma warfarin concentration increased more rapidly in the oat-fed rats than in those fed chow; however, the liver warfarin:plasma warfarin ratio following the first dose of warfarin indicated that the chow-fed rats were removing the warfarin from the plasma more rapidly. Presumably, the rate of metabolism of warfarin was more rapid in the chow-fed than

in the oat-fed rats because the prothrombin times in the former increased at a slower rate. Apparently, less liver damage occurred in the chow-fed rats because they had lower plasma fibrinogen concentrations than those fed oats. There was a 50% decline in the hematocrit values in both groups. The linear decline in the total plasma protein in each group was a function of linear declines in plasma albumin and α-globulin. In both groups, the β- and δ-globulins remained stable until 101 hr, at which time they increased. It was concluded that the response of rats to repeated toxic oral doses of warfarin was influenced by protein in the diet; rats fed higher protein diets were more tolerant to warfarin. (Author abstract by permission)

75-0945. Egle, J. L., Jr.; Hudgins, P. M. (Dept. Pharmacol., Med. Coll. Virginia, Health Sci. Div., Virginia Commonwealth Univ., Richmond, VA 23298). **Dose-dependent sympathomimetic and cardioinhibitory effects of acrolein and formaldehyde in the anesthetized rat.** *Toxicol. Appl. Pharmacol. 28(3): 358-366; 1974.* (23 references)

Dose-effect relationships for i.v. formaldehyde and acrolein indicate that the cardiovascular actions of these aldehydes are qualitatively similar to acetaldehyde and propionaldehyde. Pressor responses appear to result from the release of catecholamines from sympathetic nerve endings and from the adrenal medulla. Concentrations of formaldehyde and acrolein required to produce significant pressor activity were found to be significantly lower than for acetaldehyde and propionaldehyde. The relative pressor potency for formaldehyde and acrolein was 10 and 100 times that of acetaldehyde, respectively. Higher doses of both formaldehyde and acrolein resulted in depressor responses which could be abolished by vagotomy. Thus, it appears that these aldehydes also exert a cardioinhibitory effect which is mediated by the vagus nerve. Inhalation studies with acrolein revealed that this aldehyde has significant cardiovascular activity at concentrations below those which might be encountered in cigarette smoke. The predominant effect of inhaled acrolein at these doses was a significant increase in blood pressure and heart rate. It would appear that the aldehydes, especially acrolein, may be more significantly involved in the cardiovascular response to cigarette smoke than was previously recognized. (Author abstract by permission)

75-0946. Magos, L.; Sugata, Y.; Clarkson, T. W. (MRC Toxicol. Unit, Carshalton, Surrey, England). **Effects of 3-amino-1,2,4-triazole on mercury uptake by in vitro human blood samples and by whole rats.** *Toxicol. Appl. Pharmacol. 28(3): 367-373; 1974.* (16 references)

Catalase activity of intact human red blood cells incubated with 0.12 *M* aminotriazole in the presence of methylene blue decreased by 20% in every hour during the 3-hr incubation period. After 3-hr incubation these red blood cells washed from aminotriazole and methylene blue showed a 50% decrease in their ability to take up mercury from air saturated with mercury vapor. No inhibition in mercury uptake was observed if red blood cells were exposed to mercury while incubated with aminotriazole and methylene blue. In hemolysates mercury uptake was increased by the presence of aminotriazole. Pretreatment of rats with 1 g/kg aminotriazole, i.p., decreased the lung content and increased the liver content of mercury in rats exposed to metallic mercury vapor or injected i.v. with metallic mercury. In the latter group blood mercury concentrations and exhalation of mercury was significantly higher than in controls. These effects on the distribution of mercury with the exception of blood are similar to those observed in ethanol-pretreated rats. Both in vitro and in vivo experiments indicate that catalase plays a role in the uptake of mercury vapor. However, since aminotriazole is able to inhibit mercury uptake in vitro but increases the liver content of mercury in rats exposed to mercury vapor, either other mechanisms are available for the oxidation of atomic mercury to mercuric ion or the inhibited catalase in the liver does not lose its peroxidase activity. (Author abstract by permission)

75-0947. Coldwell, B. B.; Buttar, H. S.; Paul, C. J.; Thomas, B. H. (Drug Res. Lab., Health Protect. Br., Dept. Nat. Health and Welfare, Ottawa, Ontario, Canada). **Effect of sodium salicylate on the fate of warfarin in the rat.** *Toxicol. Appl. Pharmacol. 28(3): 374-384; 1974.* (18 references)

Salicylate (88.9 mg/kg, p.o.) decreased the blood level of radioactivity emanating from [^{14}C]warfarin (1 mg/kg, i.v. and p.o.) during the 24 hr following drug administration, reduced the area under the blood radioactivity vs. time curve, and shortened the half-life for elimination of radioactivity from the blood. During the first 6 hr after drug administration, salicylate increased the biliary excretion of radioactivity, which resulted in enhanced fecal excretion of warfarin and its metabolites. Salicylate administration initially increased and later decreased the amount of radioactivity in the liver, and increased the proportion of warfarin metabolites to unchanged warfarin in this organ. It did not affect the proportion of unchanged warfarin to metabolites in the blood, bile, and urine, or the total amount of radioactivity excreted during 48 hr in the urine and feces. In vitro, salicylate decreased the binding of [^{14}C]warfarin to rat serum proteins in a linear manner. It is concluded that, in the rat, salicylate competes with warfarin for serum protein binding sites, thereby facilitating its uptake by the liver. Second, through a combination of its choleretic action and effect on membrane transport, salicylate enhances the biliary excretion of warfarin and its metabolites, thus accounting for the decreased concentration in the blood and lowered anticoagulant action. (Author abstract by permission)

75-0948. Stoltz, D. R.; Poirier, L. A.; Irving, C. C.; Stich, H. F.; Weisburger, J. H.; Grice, H. C. (Toxicol. Div., Food Res. Lab., Health Protect. Branch, Tunney's Pasture, Ottawa, Ontario, Canada). **Evaluation of short-term tests for carcinogenicity.** *Toxicol. Appl. Pharmacol. 29(2): 157-180; 1974.* (204 references)

Current bioassays to assess the carcinogenicity of environmental agents involve cumbersome and lengthy studies in animals. Thus, the detection of potential carcinogens would benefit by the development of rapid yet reliable tests for carcinogens. Tests proposed for detecting carcinogenic activity include prescreening chemicals for accelerated tumor formation, chromosome aberrations, mutagenesis, DNA repair synthesis, teratogenesis, in vitro cell transformation, reaction with nucleic acids, and cytological alterations. Each of these test systems was critically evaluated with respect to its possible relevance to the carcinogenic process and to its practicality. Three of the tests, mutagenesis, DNA repair synthesis, and in vitro cell transformation were found to offer considerable promise as prescreens for chemical carcinogens. So far they correlate well with the carcinogenic activity of the agent under test, especially when metabolic activation of the chemical to a reactive species was effected. (Author abstract by permission)

75-0949. Johnson, J. H.; Younger, R. L.; Witzel, D. A.; Radeleff, R. D. (Vet. Toxicol. and Entomol. Res. Lab., Agr. Res. Serv., U.S. Dept. Agr., College Station, TX 77840). **Acute toxicity of tricyclohexyltin hydroxide to livestock.** *Toxicol. Appl. Pharmacol. 31(1): 66-71; 1975.* (7 references)

Thirty adult sheep of both sexes were treated intrarumenally with tricyclohexyltin hydroxide. Groups of five sheep each were treated with 750, 500, and 250 mg/kg; groups of four sheep each were given 150, 25, and 15 mg/kg; and three sheep received 50 mg/kg. All were affected except the sheep treated with 15 mg/kg. Sheep treated with 750 and 500 mg/kg had severe cardiovascular and respiratory changes at necropsy. On dermal treatment, no ill effect was observed in eight yearling cattle (two per group) sprayed with suspensions of 0.025, 0.05, 0.1, and 0.5%. Three yearling cattle were anorectic after being sprayed with the 1.0% suspension. Two baby calves (one per group) tolerated spraying at 0.075 and 0.1%. Fifteen yearling Angora goats (five per group) tolerated exposure by spraying with the 0.025, 0.05, and 0.1% suspensions. Transitory anorexia and eye irritation were noted in three goats sprayed with the 2.0% suspension. Of 15 sheep (five per group) sprayed at 0.025, 0.05, and 0.1%, no ill effect was observed. Three of five sheep were mildly affected when sprayed at 0.5%. At the 1.0% spraying, one sheep was affected and died, three sheep were mildly affected and survived, and one was unaffected. Of two sheep sprayed at 2.0%, one was mildly affected and survived, but the other sheep was affected, aborted, and died of complications. (Author abstract by permission)

75-0950. Coppage, D. L.; Matthews, E. (U.S. Environ. Protection Agency, Gulf Breeze Environ. Res. Lab., Sabine Island, Gulf Breeze, FL 32561). **Brain-acetylcholinesterase inhibition in a marine teleost during lethal and sublethal exposures to 1,2-dibromo-2,2-dichloroethyl dimethyl phosphate (naled) in seawater.** *Toxicol. Appl. Pharmacol. 31(1): 128-133; 1975.* (31 references)

To determine if brain-acetylcholinesterase (AChE) inhibition in a marine teleost *Lagodon rhomboides* (pinfish) by an organophosphate pesticide (naled) is specific enough to diagnose anticholinesterase poisoning, brain-AChE inhibition by sublethal exposure in seawater was compared to brain-AChE inhibition caused by lethal exposure. A sublethal exposure did not inhibit brain-AChE as much as lethal exposure in periods of 24, 48, and 72 hr. Consistent levels of inhibition (84-89% inhibition) occurred when 40-60% of an exposed population of pinfish was killed. This correlation of brain-AChE inhibition with exposure and death in the fish population shows that brain-AChE measurements are of value in diagnosing anticholinesterase poisoning in a marine fish. (Author abstract by permission)

75-0951. Lech, J. J.; Statham, C. N. (Dept. Pharmacol., Med. Coll. Wisconsin, Milwaukee, WI 53233). **Role of glucuronide formation in the selective toxicity of 3-trifluoromethyl-4-nitrophenol (TFM) for the sea lamprey: comparative aspects of TFM uptake and conjugation in sea lamprey and rainbow trout.** *Toxicol. Appl. Pharmacol. 31(1): 150-158; 1975.* (14 references)

This report is concerned with the comparative aspects of disposition and conjugation of 3-trifluoromethyl-4-nitrophenol (TFM), a selective sea lamprey larvicide, in sea lamprey (*Petromyzon marinus*) and rainbow trout (*Salmo gairdneri*). When exposed to identical water concentrations of TFM, sea lamprey ammocoetes exhibited a higher rate of accumulation and an increased steady-state level of TFM compared to trout. Regardless of the life stage of sea lamprey or size of trout studied, sea lamprey revealed a higher concentration of free TFM in blood and tissues. The higher concentration of TFM in lamprey blood was demonstrated at a variety of water concentrations of TFM. In vitro glucuronyl transferase assays demonstrated that the sea lamprey had a lower rate of formation of TFM glucuronide when compared to trout. In vivo, sea lamprey exhibited a much higher ratio of free to conjugated TFM than trout. Pretreatment of sea lamprey and trout with salicylamide, an inhibitor of glucuronyl transferase, shifted the LC50 for trout from 9.7 mg/l to 3.6 mg/l and did not alter the LC50 for sea lamprey. (Author abstract by permission)

75-0952. Smirnov, V. S.; Kolesnikov, Yu. G. (Dept. Skin and Venereal Dis., S. M. Kirov Military Med. Acad., Leningrad, USSR). **K voprosu o porfirinogennoy aktivnosti nekotorykh farmakologicheskikh sredstv.**

[Porphyrinogenic activity of certain pharmacological agents.] *Vestn. Dermatol. Venerol. 48: 48-51; 1974.* (27 references) (Russian)

The effect of cerain drugs on hexachlorane (BHC)-induced experimental porphyria was studied in male rats. The animals were fed 120 mg/kg doses of hexachlorane daily for 14 days, after which the dose was cut to half. Veronal administered during experimentally induced porphyria was found to complicate the course of the latter and to cause death 5-6 days earlier than in a control group. Prednisolone prolonged the life of the experimental animals by 6-7 days. A vitamin complex consisting of ascorbic acid, thiamine, riboflavin, and pyridoxine prolonged life by 1-2 days.

75-0953. Kanayev, A. I.; Grishchenko, L. I.; Trondina, G. A. (All-Union Inst. Exp. Vet., USSR). **Diagnostika otravleniy ryb propanidom. [Diagnosis of poisoning of fish by propanide.]** *Veterinariya (Moscow) 11: 110-112; 1974.* (Russian)

The toxicity of propanide (3,4-dichloropropionanilide, propanil) was studied in carp and loach under laboratory and field conditions. The LD50 was determined to be in the range of 6-7.2 mg/l, while concentrations in the ranges of 3.6-5.4 mg/l and 2.4-0.72 mg/l caused subacute and chronic poisoning, respectively. Gradual development of the clinical symptoms of poisoning, such as absence of feeding reflex, depression, loss of balance, tremor and cachexia, was observed in fish exposed to 2.4-1.44 mg/l concentrations. Increased erythrocyte count, appearance of immature forms, neutrophilia, degeneration of the erythrocytes, and increased methemoglobin level were found. Histological investigations revealed stasis and hyperemia, granular hydropic and fatty degeneration in the liver, hypoplasia of the hemopoietic tissue with dystrophy and partial necrosis in the kidney, and decay of erythrocytes in the splenal parenchyma. The cumulation factor of propanide in the organs of fish kept in water with 0.72-0.2 mg/l was 10-15 on the 10th day, and 2-5 afterwards. Propanide persisted in water for 5-9 days in a 0.2 mg/l concentration. A thin-layer chromatographic method developed for the determination of propanide in water employs extraction with chloroform and chromatographic analysis on an alumina layer, using a 1:1 ratio of carbon tetrachloride with ether as a solvent system and 2% sodium nitrate solution in hydrochloric acid plus potassium hydroxide with 0.2% alpha-naphthol for visualization. The sensitivity of the method is 0.5 mg/kg.

75-0954. Bollen, W. B.; Norris, L. A.; Stowers, K. L. (Forest. Sci. Lab., Pacific Northwest Forest and Range Exp. Sta., Corvallis, OR 97331). **Effect of cacodylic acid and MSMA on microbes in forest floor and soil.** *Weed Sci. 22(6): 557-562; 1974.* (22 references)

Cacodylic acid (hydroxydimethylarsine oxide) and MSMA (monosodium methanearsonate) gave slightly-visible inhibition of bacterial growth in pure culture at 1000 mg/l arsenic and moderate inhibition at 10,000 mg/l arsenic. There were no effects at 100 mg/l arsenic. Carbon dioxide evolution from three kinds of forest floor declined with increasing concentrations of MSMA and cacodylic acid. Increasing concentrations of MSMA caused an increase in carbon dioxide evolution from soil but cacodylic acid had no effect. Concentrations less than 10 mg/kg arsenic forest floor including L, F, and H horizons, or soil had no pronounced effect on organic matter decomposition. (Author abstract by permission)

75-0955. Yaklich, R. W.; Karczmarczyk, S. J.; Devlin, R. M. (Agr. Res. Serv., U.S. Dept. Agr., Beltsville, MD 20705). **Metabolism of ^{14}C-SAN-6706 and ^{14}C-norflurazon in cranberry plants.** *Weed Sci. 22(6): 595-599; 1974.* (6 references)

The metabolism of ^{14}C-SAN-6706 [4-chloro-5-(dimethylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone] and ^{14}C-norflurazon [4-chloro-5-(methylamino)-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone] were studied in cranberry plants (*Vaccinium macrocarpon* Ait. 'Early Black') for a 36-day period. Both compounds were readily translocated with progressively more label being present in the shoot portion with time. The two compounds are demethylated to the desmethyl analogue SAN-9774 (4-chloro-5-amino-2-(α,α,α-trifluoro-*m*-tolyl)-3(2H)-pyridazinone). Berry samples from cuttings contained no detectable radioactivity while samples from 2 year-old cranberry plants contained 20 ppb or less. (Author abstract by permission)

75-0956. Carter, G. E., Jr.; Camper, N. D. (Dept. Plant Pathol. and Physiol., Clemson Univ., Clemson, SC 29631). **Soil enrichment studies with trifluralin.** *Weed Sci. 23(1): 71-74; 1975.* (24 references)

Soil enrichment studies were conducted with trifluralin (α,α,α-trifluoro-2,6-dinitro-*N*,*N*-dipropyl-*p*-toluidine) with and without exogenous carbon and nitrogen. From 72 bacterial isolates obtained, eight representative ones were tentatively identified as members of the genus *Pseudomonas* based on size, shape, Gram reaction, and reaction on fluorescent and motility agar. Two of these eight isolates exhibited a significant increase in numbers of viable cells when grown in a medium with trifluralin as the only exogenous carbon and nitrogen source. Chromatographic analysis of culture medium extracts revealed the presence of the degradation product which was not present in the herbicide control. The concentration of this unknown was greatest at the 50 mg/l level of trifluralin which also supported the greatest bacterial growth. (Author abstract by permission)

75-0957. Magee, P. S. (Chevron Chem. Co., Richmond, CA 94801). **New aspects of organophosphorus**

pesticides. II. Structure and bioactivity of Orthene insecticide analogs. *Residue Rev. 53: 3-18; 1974.* (6 references)

Analogs of Orthene insecticide (*O,S*-dimethyl acetylphosphoramidothioate, acephate) with variations of *O, S,* and *N* substitution were prepared and tested on several insects. Highest activity was associated with *O,S*-dimethyl analogs having relatively simple, saturated linear *N*-acyl groups. In fact, activity remained high to chain lengths $>C_{14}$, some members being better miticides than Orthene insecticide and nearly equivalent aphicides. α-Methoxy and γ-chloro substitutions gave remarkable enhancements while branching, cyclization, conjugated unsaturation, phenyl groups, β-alkoxy, and α-halo groups generally reduced bioactivity. With few exceptions, the best analogs of Orthene insecticide were found to combine high insecticidal activity with moderate to low mammalian toxicity. The oral LD50 values for male and female Sprague-Dawley rats are also reported for many of the compounds tested; they range from 3-4 mg/kg to 2000 mg/kg, with most falling in the range of 100-500 mg/kg. (Author abstract by permission, supplemented)

75-0958. Gaughan, E. J.; Menn, J. J. (Stauffer Chem. Co., Western Res. Cent., Richmond, CA 94804). **New aspects of organophosphorus pesticides. III. 3-(Thiophosphorylimino-)-oxazolidines, -thiazolidines, -thiazolines, and related compounds as insecticides and acaricides.** *Residue Rev. 53: 19-33; 1974.* (7 references)

A series of 3-(thiophosphorylimino)-oxazolidines, -thiazolidines, -thiazolines, and -perhydrooxazines has been prepared and evaluated for insecticidal and acaricidal activity. Many of these compounds exhibited a high level of biological activity, particularly as systemic insecticides and acaricides. In general, the thiolophosphoryl isomers were more active than the thiono compounds. The highly active insecticides discovered in this work have also proven to be highly toxic to mammalian species. Acute oral toxicities are reported for the oxazolidine compounds in adult female rats. An insecticidally active thiazolidine compound, *O,S*-dimethyl *N*-methyl thiolophosphate, had an oral LD50 of 1.5 mg/kg for female rats and an acute rabbit dermal LD50 of 3.16 mg/kg. The metabolism of one compound from this series was examined in cotton plants, houseflies, and model enzymatic oxidation systems; it was quite stable in the first two. The principal metabolite, the 4-keto derivative, was of reduced insecticidal activity but constant mouse toxicity. (Author abstract by permission, supplemented)

75-0959. Menn, J. J.; McBain, J. B. (Stauffer Chem. Co., Agr. Res. Cent., Mountain View, CA 94942). **New aspects of organophosphorus pesticides. IV. Newer aspects of the metabolism of phosphonate insecticides.** *Residue Rev. 53: 35-51; 1974.* (34 references)

The metabolism of a number of alkyl- and phenylphosphonates representing insecticides, a fungicide, and a plant-growth regulator is reviewed with special reference to the fate of the phosphorus moiety, the comparative toxicity of phosphonates and their analogous phosphates to mammals and insects, and the ultimate disposition of the P–C bond of the phosphonate moiety. In most instances, the metabolism of phosphonates in mammals and higher plants is similar to that so abundantly described for phosphates except that the P–C bond usually remains intact and the terminal metabolites are alkyl- or arylphosphonic acid derivatives. Certain phosphonates are unstable and these include the 2-chloroethylphosphonate insecticides, trichlorfon and Butonate, and the plant-growth regulator, ethephon, which readily undergo P–C bond cleavage in both biological and nonbiological systems. A phenylphosphonate fungicide, Inezin, apparently also cleaves in plants at the P–C linkage. Many bacterial strains have been described with the ability to catabolize the phosphonate P–C bond. Thus, alkyl- and arylphosphonate terminal metabolites from animals and plants once passed into the environment are likely to be mineralized by microorganisms and reenter the phosphate pool. Comparative studies between directly analogous phosphonate-phosphate insecticide pairs show that the phosphonates are generally more toxic to mammals and insects and their oxons are better inhibition of cholinesterase. The greater toxicity of phosphonates to certain injurious OP-resistant insect species may be the result of more efficient intoxication by the phosphonate oxons. (Author abstract by permission)

75-0960. Wustner, D. A.; Fahmy, M. A.; Fukuto, T. R. (Div. Toxicol. Physiol., Dept. Entomol., Univ. of California, Riverside, CA 92502). **New aspects of organophosphorus pesticides. V. Oxidative rearrangement of organophosphorus thionate esters.** *Residue Rev. 53: 53-65; 1974.* (11 references)

Biological oxidations are of great importance in the in vivo modification of pesticides. A number of chemical oxidation systems have been proposed as models of these biological processes. Treatment of the organophosphorus thionate esters Dyfonate (fonofos) and *N*-(dimethoxyphosphinothioyl)-carbofuran with *m*-chloroperoxybenzoic acid in dichloromethane yields both the expected oxons as well as rearrangement products. A mechanism is proposed that assumes that an initial *S*-oxide intermediate is formed that then either extrudes sulfur to form the oxon or rearranges to form, from Dyfonate, phenyl ethoxy(ethyl)phosphinyl disulfide. This disulfide decomposes into both *O*-ethyl ethylphosphonic acid and *O*-ethyl ethylphosphonothioic acid plus diphenyl disulfide. This mode of decomposition is not consistent with ^{18}O labeling data from biological microsomal systems and thus the rearrangement products from the peracid system are probably not significant products in microsomal oxidations. (Author abstract by permission)

75-0961. Borkovec, A. J. (Insect Chemosterilants Lab., Agr. Environ. Qual. Inst., Beltsville, MD 20705). **New aspects of organophosphorus pesticides. VI. Organophosphorus insect chemosterilants.** *Residue Rev. 53: 67-77; 1974.* (30 references)

Alkylating derivatives of phosphoric and phosphorothioic acids and cyclic azaphosphorines are chemical cytostatic and mutagenic agents with selective activity on gonadal tissues of insects. Structure-activity relationship studies revealed a primary role of the alkylating moiety and secondary role of the phosphorus carrier moiety. Toxicological properties of this class of chemosterilants are basically different from those of phosphorus insecticides. Nonalkylating organophosphorus chemosterilants show similarities in mode of action that implicate possible activation step as a condition for biological activity. Structure-activity correlations indicate species-specific differences in metabolic patterns and much narrower range of activity as compared with the alkylating analogs. Experiments with synergists and with resistant strains of insects revealed some basic differences between the biological activity of phosphorus chemosterilants and insecticides. Metabolism of these compounds in higher animals is similar to that in insects; however, the effects of the compounds are not the same. Toxic effects predominate over sterilizing effects in higher animals. (Author abstract by permission, supplemented)

75-0962. Waggoner, T. B.; Khasawinah, A. M. (Chemagro Div., Baychem Corp., Kansas City, MO 64120). **New aspects of organophosphorus pesticides. VII. Metabolism, biochemical, and biological aspects of Nemacur and related phosphoramidate compounds.** *Residue Rev. 53: 79-97; 1974.* (10 references)

A general metabolic pathway for Nemacur in soil, plants, and animals is described. Major degradation routes are thiooxidation, dealkylation, hydrolysis, and subsequent conjugation of phenols. Significant residues in soil and plants consist of Nemacur and Nemacur sulfoxide in the early stage of degradation, but after the disappearance of the parent compound, the significant terminal residue consists of mainly Nemacur sulfoxide and lesser amounts of Nemacur sulfone. The remainder of the residue consists of conjugated phenols and fragments which have been incorporated into naturally-occurring plant materials. Degradation in animals is rapid and nearly all the residue is excreted in the first ten to 15 hours. Residues do not accumulate in tissues or milk of cattle. Nemacur has been shown as a more active nematicide against parasitic nematodes than the corresponding *N*-methyl substituted phosphoramidate analogs. Biological activity and the duration of effectiveness in soil for the major metabolite, Nemacur sulfoxide, is similar to Nemacur. The effect of Nemacur, Nemacur sulfoxide, and Nemacur sulfone on soil populations of ectoparasitic nematodes is related to the persistence of the compound in soil; that is, Nemacur is the most effective and has the highest persistence, whereas Nemacur sulfone is the least effective and is the least persistent. Against endoparasitic nematodes Nemacur sulfone is more effective than Nemacur sulfoxide, and this may be a result of the higher concentration of Nemacur sulfone in the roots. (Author abstract by permission)

75-0963. Tolkmith, H.; Mussell, D. R. (Dow Chemical U.S.A., Midland, MI 48640). **New aspects of organophosphorus pesticides. VIII. Structure and fungitoxicity of organophosphorus compounds.** *Residue Rev. 53: 99-108; 1974.* (11 references)

Fungitoxic organophosphorus compounds developed during the past decade form two distinctly different classes: nonheterocyclic phosphorus-sulfur compounds and phosphorus derivatives of nitrogen heterocyclics. The former have a rather narrow spectrum of activity and are acceptable substitutes for organic mercurials in the control of rice blast, but tend to be rather toxic to mammals and have a common structural moiety. Members of the other class of phosphorus compounds show a different and broader spectrum of antifungal activity, a considerable variation in mammalian toxicity, and do not possess a common structural moiety. Even the presence of the phosphorothionyl group is not of critical importance. Also, there are good reasons for believing that at least some of the phosphorus derivatives of nitrogen heterocyclics act in fungi by a mechanism that is not based upon phosphorylation. (Author abstract by permission, abridged)

75-0964. Kenaga, E. E. (Dow Chem. Co., Midland, MI 48640). **Toxicological and residue data useful in the environmental safety evaluation of dalapon.** *Residue Rev. 53: 109-151; 1974.* (91 references)

This review includes the physical and chemical properties of dalapon and its sodium and magnesium salts; distribution of dalapon and metabolites as residues in soil, water, plants, and animals; and toxicity of dalapon to mammals, birds, fish, other aquatic organisms, terrestrial invertebrates, honey bees, algae, bacteria, and fungi. Microorganisms under suitable growing conditions acquire the ability to rapidly metabolize dalapon in soil and water in one to two weeks. Dalapon is slowly degraded in plants and animals, in water of high or low pH, and in environments which are cold (below 60°F) or dry or otherwise inhospitable to microorganisms. Dalapon hydrolyzes in water under high temperature and light conditions. Residues of dalapon are not accumulated in tissues of animal organisms significantly above those of their diet or surrounding environment and decrease rapidly upon withdrawal from exposure to dalapon. A large amount of unchanged dalapon is excreted in the urine of mammals. Dalapon is degraded in the environment or metabolized by organisms through dechlorination, dehydrochlorination,

and oxidation to chloride ion, pyruvic acid (pyruvate), alanine, carbon dioxide, and other minor or intermediate transitory compounds. Dalapon is not a hazard acutely or chronically at dosage rates used in commercial applications to mammals, birds, fish, insects, earthworms, and microorganisms. No teratogenic or significant reproductive effects have been noted in a large number of tests with birds or animals treated with dalapon. No significant environmental or commercial problems have been observed over a period of many years of widescale use. This can be accounted for by the low toxicity of dalapon to most species of plants, low toxicity and low residue values found in nearly all exposed animal organisms, and rapid metabolism by microorganisms. Pyruvic acid, the major metabolite of dalapon, is a natural constituent of essential energy cycle systems of animal organisms. (Author abstract by permission)

See also 75-0771 75-0780 75-0782 75-0791 75-0796 75-0832

75-0965. Rickett, F. E.; Henry, P. B. (Wellcome Res. Lab., Berkhamsted, Hertfordshire, England). **Quantitative determination of the enantiometric purity of synthetic pyrethroids. Part II. *S*-bioallethrin.** *Analyst (London) 99(1179): 330-337; 1974.* (21 references)

S-Bioallethrin consists primarily of (+)-allethronyl-(+)-*trans*-chrysanthemate, but technical samples contain small amounts of other allethrin isomers. The ratio of diastereoisomers can be measured directly from the nuclear magnetic resonance spectrum after using a europium shift reagent, when many of the resonances split into two distinct diastereoisomer signals. If the enantiomeric purity of the chrysanthemate moiety is determined independently, then the absolute enantiomeric purity of the allethrin sample can be calculated. Standard deviations for the measurement of laboratory or technical samples were between 0.3 and 0.7 per cent. The accuracy of the method was verified by independently determining the enantiomer ratios of various allethrolone samples by gas chromatography of their diastereoisomeric (-)-α-methoxy-α-trifluoromethylphenylacetic esters, esterifying with natural (+)-*trans*-chrysanthemic acid and redetermining the enantiomeric purity by nuclear magnetic resonance. Good agreement was achieved between the two determinations. The nuclear magnetic resonance method should also be suitable for measuring the diasteroisomer ratio of *cis*-allethrins. (Author abstract by permission)

75-0966. Turner, C. R. (Cent. Overseas Pest Res., Div. Chem. Control, Salisbury, Wiltshire, England). **Spectrophotometric determination of organophosphorus pesticides with 4-(4-nitrobenzyl)pyridine.** *Analyst (London) 99(1180): 431-434; 1974.* (9 references)

A spectrophotometric method has been developed for the determination of certain organophosphorus pesticides. It involves the reaction of 4-(4-nitrobenzyl)-pyridine with the pesticide in an acetone-water-ethanol mixture at 100°C to produce the dye precursor. The color is produced after the addition of tetraethylenepentamine. (Author abstract by permission)

75-0967. Thier, H. P. (Inst. Angew. Chem., Univ. Erlangen-Nuernberg, Erlangen, Germany). **Analysis of herbicides.** *Angew. Chem. Int. Ed. 13(4): 217-224; 1974.* (92 references)

English translation; for an abstract of the original German article, *Angew. Chem.* 86(7): 244-251; 1974, see abstract no. 74-2002.

75-0968. Svetlicic, B.; Wilhelm, K. (Med. Fac., Univ. Zagreb, Zagreb, Yugoslavia). **Methods of measuring exposure to anticholinesterase insecticides.** *Arh. Hig. Rada Toksikol. 24: 357-365; 1973.* (27 references)

The amount of exposure to pesticides may be directly determined by means of absorbent pads and clothing, washes, and similar techniques. Direct measurement of the concentration in the air can also be made. Indirect methods include the detection of pesticide compounds or their metabolites in body tissues or excreta, or the registration of some biochemical changes caused by the absorbed product. The determination of cholinesterase activity has been used more than any other method for measuring exposure to anticholinesterase pesticides, organophosphates, and carbamates, and will continue to be of value for organophosphate insecticides. The toxic action of organophosphorus compounds is accepted to be closely linked with their ability to inhibit cholinesterase and thus to interfere with the proper functioning of the nervous system, allowing acetylcholine to accumulate. Cholinesterase activity determination can be an index of absorption of anticholinesterases, but the interpretation of enzyme depression is complex and requires more information. Finding organophosphorus compounds or their metabolites in blood and urine indicates recent exposure, while the fall in enzyme activity represents the sum of the physiological effects of repeated exposure lasting sometimes for weeks or months. Both the degree and the rate of enzyme depression must be measured. Since there is a great distribution range of normal cholinesterase activity values between individuals, a preexposure enzyme activity determination is extremely important. Various methods which have been developed for cholinesterase determination are briefly discussed. Some results of studies on volunteers and workers exposed to anticholinesterases are reported.

75-0969. Chiou, C. Y. (Dept. Pharmacol. Ther., Univ. Florida, Coll. Med., Gainesville, FL 32610). **A simple and sensitive method for the determination of enzymatic hydrolysis of various esters.** *Biochim. Biophys. Acta 327: 374-379; 1973.* (10 references)

A simple method was developed to determine the enzymatic hydrolysis of various esters. The principle of this method is that $^{14}CO_2$ produced from interaction between $NaH^{14}CO_3$ and acid produced from esters hydrolyzed by esterases is trapped with 2-phenethylamine and counted with a liquid scintillation counter. The advantages of this method are manyfold: it is much simpler and more sensitive than the Warburg technique, allowing the use of substrate concentrations as low as 10^4 *M* acetylcholine; it is applicable to any ester substrates, in contrast to spectrophotometric methods which are confined to thioesters as substrates; it is much less expensive than the radioactive substrates used in the radiosotopic method; and finally, it is much less complex in operation than the pH-stat method. (Author abstract by permission)

75-0970. Chandler, J. H., Jr.; Sanders, H. O.; Walsh, D. F. (Southeastern Fish Control Lab., U.S. Bureau Sport Fisheries Wildlife, Warm Springs, GA). **An**

improved chemical delivery apparatus for use in intermittent flow bioassays. *Bull. Environ. Contam. Toxicol. 12(1): 123-128; 1974.* (4 references)

A metering device containing no moving parts has been devised to deliver small volumes of toxicant in intermittent-flow bioassay procedures using aquatic organisms. The toxicant delivery system offers several advantages over other such systems, including simplicity of construction, low cost, accuracy, and minimal maintenance. It can be constructed quickly from materials available in a well equipped laboratory. The consistency of delivery of this metering device was compared with that of two others using a dye dilution technique. The coefficient of variation in this device was 1.46 compared with 2.4 and 6.6 for the other two. The construction and operation of the metering device are described, as is the operation of the continuous-flow toxicant supply apparatus.

75-0971. Gunther, F. A.; Barkely, J. H.; Westlake, W. E. (Dept. Entomol., Univ. California, Riverside, CA 92502). **Worker environment research. II. Sampling and processing techniques for determining dislodgable pesticide residues on leaf surfaces.** *Bull. Environ. Contam. Toxicol. 12(6): 641-644; 1974.* (2 references)

A previously reported procedure for determining dislodgable pesticicde residues on leaf surfaces has been revised to simplify and improve the laboratory routine. The citrus leaf punches were modified to permit the use of larger collection jars. Storage of leaf discs should be avoided, but if discs must be stored, preliminary tests should be made to determine whether there may be an adverse storage effect, as has been indicated for Omite (propargite) and ethion. Recoveries were generally maximum when the jars containing the leaf discs and stripping solution were shaken end-to-end for 20 minutes at 20 cycles/min; shorter times might suffice for some compounds. Three shakings are always required for maximum recovery. The preferred solvent and the number of equilibrations required for satisfactory and reproducible recoveries must be determined for each pesticide.

75-0972. Zitko, V.; Hutzinger, O.; Choi, P. M. K. (Biol. Station, St. Andrews, New Brunswick, Canada). **Determination of pentachlorophenol and chlorobiphenylols in biological samples.** *Bull. Environ. Contam. Toxicol. 12(6): 649-653; 1974.* (11 references)

Gas chromatography was used to determine the pentachlorophenol and chlorobiphenylol concentrations in white shark liver, double-crested cormorant and herring gull eggs, juvenile Atlantic salmon, white flounder, cod, and sea raven. Low, but easily detectable levels of pentachlorophenol were found in most of the samples; the concentrations were most likely insignificant toxicologically. The procedure was useful in detecting chlorobiphenylols in the μg/g range in spiked samples, but all natural samples contained some unidentified compounds in the chlorobiphenylol fraction. The unidentified compounds were probably phenols. The recovery of 2,4′-dichloro-4-biphenylol and 2,2′,5′-trichloro-4-biphenylol from the spiked samples decreased with decreasing level of spiking.

75-0973. Erney, D. R. (Food Drug Admin., Detroit, MI 48207). **A feasibility study of miniature silica gel columns for the separation of some polychlorinated biphenyls, DDT, and analogs.** *Bull. Environ. Contam. Toxicol. 12(6): 710-717; 1974.* (6 references)

PCBs consisting of Aroclors 1242, 1248, 1254, and 1260 and pesticide compounds consisting of *p,p′*-DDE, *p,p′*-TDE, and *p,p′*-DDT were individually tested for recovery from miniature columns of silica gel. Mixtures of each of the PCBs individually combined with *p,p′*-DDE, *p,p′*-TDE, and *p,p′*-DDT were also tested for separation and recovery on miniature columns. Recoveries were 87-99% of added PCB and 90-99% of added *p,p′*-DDE in the petroleum ether fraction and 90-100% of added *p,p′*-TDE and 75-87% of added *p,p′*-DDT in the acetonitrile/hexane/methylene chloride fraction. For mixtures of PCBs and organochlorine compounds, recoveries were from 86-98% of added PCB and 80-93% of added *p,p′*-DDE in the petroleum ether fraction and 93-100% of added *p,p′*-TDE and 69-99% of added *p,p′*-DDT in the acetonitrile/hexane/methylene chloride fraction. Thus, miniature silica gel columns are capable of separating total PCB and *p,p′*-DDE from *p,p′*-TDE and *p,p′*-DDT. *p,p′*-DDE can be quantitated in the presence of PCBs provided the concentrations of the latter are not excessive.

75-0974. Erney, D. R. (Food Drug Admin., Detroit, MI 48207). **A feasibility study of miniature florisil columns for the separation of some chlorinated pesticides.** *Bull. Environ. Contam. Toxicol. 12(6): 717-721; 1974.* (3 references)

The feasibility of using miniature Florisil columns for the separation of a representative variety of chlorinated pesticides (lindane, heptachlor, aldrin, heptachlor epoxide, dieldrin, endrin, *p,p′*-DDE, *p,p′*-TDE, *p,p′*-DDT, and endosulfan sulfate) was evaluated. The miniature Florisil column separated the pesticides in the same manner as the official Florisil column. Recoveries ranged from 86-102% of the theoretical value, as compared to 83-107% with the official column. The amounts of reagents used for the miniature column were approximately 20% of these necessary for the official method, and the elution time was shortened by 2/3. The use of miniature columns would be ecologically advantageous in waste disposal.

75-0975. Mallet, V.; Brun, G. L. (Univ. Moncton, Moncton, New Brunswick, Canada). **A rapid and reliable**

in situ spectrophotofluorometric method for the analysis of Co-Ral and bayrusil in lake and sewage water. *Bull. Environ. Contam. Toxicol. 12(6): 739-744; 1974.* (6 references)

Lake and sewage water was collected and spiked with known amounts of Bayrusil (quinalphos) and Co-Ral (coumaphos). The pesticides were then extracted, spotted on thin-layer chromatograms and made to fluoresce by heating the chromatograms at a specific temperature for a definite period of time. Under the experimental conditions, instrumental limits of detection were 0.001 μg for Co-Ral and 0.008 μg for Bayrusil. There was a linear relationship between concentration and relative fluorescence intensity. Co-Ral and Bayrusil were detectable at the 0.1 ppb level in lake water and sewage water: detection of lower concentrations in sewage water was difficult due to problems encountered in the extraction procedure. Thus, in situ fluorometric techniques can feasibly be used for the analysis of certain organophosphorus pesticides in water.

75-0976. Lawrence, J. F.; McLeod, H. A. (Food Res. Labs., Health Protection Br., Dept. Nat. Health Welfare, Tunney's Pasture, Ottawa, Ontario, Canada). **A low temperature cleanup procedure for triazine herbicides in root crops.** *Bull. Environ. Contam. Toxicol. 12(6): 752-758; 1974.* (10 references)

A low temperature cleanup procedure for triazine herbicides (atrazine and simazine) in root crops (turnips, parsnips, carrots, potatoes) was evaluated. For the polar pesticides, acetone/benzene/1 *N* H_2SO_4 proved to be a better extraction solvent than acetone + benzene. Crop extracts of the herbicides were suitably cleaned up by low temperature precipitation for GLC and nitrogen detection. The results were greatly improved when the extracts for GLC were evaporated to dryness and redissolved in hexane. Although the triazine peaks appeared near the solvent front when run isothermally, temperature programming provided a much better separation of sample components. The EC detector was unsuitable for triazine analysis using the low temperature cleanup technique on the crops studied.

75-0977. Hammock, L. G.; Hammock, B. D.; Casida, J. E. (Dept. Biol. Sci., Northwestern Univ., Evanston, IL 60201). **Detection and analysis of epoxides with 4-(*p*-nitrobenzyl)-pyridine.** *Bull. Environ. Contam. Toxicol. 12(6): 759-764; 1974.* (16 references)

The alkylation of 4-(*p*-nitrobenzyl)-pyridine (NBP) to form a blue derivative is one method used for the detection and analysis of epoxides. The NBP reagent provides a sensitive test for epoxides derived from allyl, isobutenyl, and closely related substituents. Other compounds easily detected in concentrations of 0.01-0.1 μmole are: 15 substitued-phenyl 6,7-epoxygeranyl ethers or 2,3,6,7-diepoxygeranyl ethers; 10 esters of epoxychrysanthemic and epoxyethanochrysanthemic acids derived from pyrethroid insecticides; and epoxyrotenone, a photoproduct of rotenone. The method is less satisfactory for volatile epoxides and is insensitive for epoxycycloalkanes and related compounds. The NBP reagent also detects many other types of alkylating agents including organophosphorus compounds. The epoxides easily detected on thin-layer and paper chromatograms are those for which NBP reagent provides a sensitive method of analysis. Lower reaction temperatures or shorter incubation periods are preferable for highly reactive epoxides; alkylating agents are interfering materials. The NBP reagent is useful in monitoring enzymatic reactions with epoxide substrates. The use of a microcuvette and smaller reagent volumes permits reproducible determinations at levels below 0.004 μmole.

75-0978. Sauer, H. H.; Bosshardt, H. P.* (Swiss Federal Res. Sta. Arboriculture Horticulture, CH 8820, Wadenswil, Switzerland). **Collaborative study of two analytical methods for the analysis of formothion formulations.** *J. Ass. Offic. Anal. Chem. 57(4): 771-777; 1974.* (8 references)

The 2 methods collaboratively studied were a gas-liquid chromatographic (GLC) method, using either a flame photometric or a flame ionization detector, a column packed with 3% OV-225 on 80-100 mesh Chromosorb W (HP), and an internal standard; and a paper chromatographic (PC/C) method in which the chromatographed spot is combusted and the formothion content is determined colorimetrically as phosphorus. Four samples of formothion, 50% technical solution, 25 and 33% emulsifiable concentration, and 70% ultralow volume formulation, were studied. Collaborative results for the GLC method (5 collaborators for 3 samples and 7 collaborators for 1 sample) were satisfactory, with standard deviations ranging from 0.57 to 1.42. PC/C values (3 collaborators) were higher but still satisfactory with standard deviations ranging from 1.50 to 5.22. Both methods have been adopted as full CIPAC methods, with the GLC method as the reference method. The GLC method has been adopted as official first action by the AOAC. (Author abstract by permission)

75-0979. Perry, J. A.; Glunz, L. J.* (Regis Chem. Co., Morton Grove, IL 60053). **Sensitivity enhancement by programmed multiple development in thin layer chromatography.** *J. Ass. Offic. Anal. Chem. 57(4): 832-837; 1974.* (9 references)

Programmed multiple development (PMD) is an automatic, cyclic method for a new type of multiple development in thin layer chromatography (TLC). PMD instrumentation allows any number of samples to be developed identically, automatically, and simultaneously. PMD, given equal time of development with respect to conventional TLC development, yields a sensi-

tivity enhancement for major components (in the sample to be detected) of about 10, given also the same sample quantity. The resolution of PMD chromatograms does not reflect either spot size or overloading up to at least a factor of 20; thus PMD accommodates auxiliary techniques for sensitivity enhancement. The ultimate PMD sensitivity enhancement for traces of substances has yet be determined. (Author abstract by permission)

75-0980. Ernst, W.; Schaefer, R. G.; Goerke, H.; Eder, G. (Inst. Meeresforschung, Bremerhaven, Germany). **Aufarbeitung von Meerestieren fuer die Bestimmung von PCB, DDT, DDE, DDD, γ-HCH und HCB. [A method for working up marine organisms for the determination of PCBs, DDT, DDE, DDD, γ-HCH and HCB.]** *Fresenius' Z. Anal. Chem. 272(5): 358-363; 1974.* (11 references) (German)

Frozen tissues are homogenized with quartz sand and Na_2SO_4. The resulting tissue powder is subjected to a cold extraction procedure with *n*-hexane/acetone (2:1) in a glass column. Clean-up of extracts is made on Al_2O_3 for fat removal and on Florisil with 0.6-1.0% water content yielding two fractions which contain PCBs, DDE, HCB, DDT, DDD (TDE), and γ-BHC. The overall recovery is 80-90% for HCB and 92-100% for the other compounds. (Author abstract by permission)

75-0981. Thielemann, H. (Halberstadt, DDR). **Zur semiquantitativen duennschichtchromatographischen Bestimmung von DDT in Huhnereiern. [Semiquantitative thin-layer chromatographic determination of DDT in hens' eggs.]** *Fresenius' Z. Anal. Chem. 272(5): 368; 1974.* (1 reference) (German)

A previously described thin-layer chromatographic method for determination of DDT in eggs can be substantially simplified by using ready-made TLC sheets. Yolks from hens' eggs produced on small farms in July-August 1973 or purchased from markets, and containing 0.1-1 μg DDT or duck eggs containing up to 25 μg DDT were analyzed. The eggs were hard boiled and extracted with boiling chloroform. The residue after chloroform evaporation is extracted with acetonitrile, and the residue, dissolved in petroleum ether, is cleaned up on an alumina-silica gel column. The eluate can be further cleaned up by distillation if necessary. Activated ready-made silica gel sheets may require purification by elution using the same solvent as the subsequent chromatography in order to remove interfering materials. The chromatoplates are then developed using *n*-hexane as a solvent and a running time of 10-15 min. The *Rf* of DDT in this system is 52. To develop the chromatograms, these are treated uniformly with ca. 60 ml of spray reagent solution (ammoniacal silver nitrate), and after drying, irradiated under UV until the DDT spots have fully developed.

75-0982. Veith, G. D.; Kuehl, D. W.; Rosenthal, J. (Environ. Protect. Ag., Nat. Water Qual. Lab., Duluth, MN 55804). **Preparative method for gas chromatographic/mass spectral analysis of trace quantities of pesticides in fish tissue.** *J. Ass. Offic. Anal. Chem. 58(1): 1-5; 1975.* (15 references)

A large capacity, low efficiency pesticide cleanup method is combined with a small capacity, high efficiency method for gas chromatographic/mass spectral analysis of fish tissue. Trace chemicals are extracted from the tissue, removed from the bulk of the co-extracted lipids through selective desorption from Micro Cel-E, and isolated from the remaining lipids by gel permeation chromatography. The procedure is capable of cleaning up the extract from several hundred grams of fish, minimizes sample contamination, and permits identification of xenobiotic chemicals present at ng/g concentrations. (Author abstract by permission)

75-0983. Miller, W. W.; Wilkins, J. S.; Dunham, L. L. (Anal. Res., Zoecon Corp., Palo Alto, CA 94304). **Determination of Altosid insect growth regulator in waters, soils, plants, and animals by gas-liquid chromatography.** *J. Ass. Offic. Anal. Chem. 58(1): 10-18; 1975.* (12 references)

Residues of isopropyl (2*E*,4*E*)-11-methoxy-3,7,11-trimethyl-2,4-dodecadienoate (Altosid) insect growth regulator are determined in waters, soils, plants, milk, eggs, fish, shellfish, poultry, and cattle tissues, blood, urine, and feces. Acetonitrile is the primary extraction solvent for all samples. Residues are extracted by high-speed blending followed by vacuum filtration. Fatty extracts are subjected to cold-temperature precipitation and filtration. Samples are cleaned up by petroleum ether partitioning and Florisil and neutral alumina chromatography. The concentrated eluants are analyzed by gas-liquid chromatography (GLC) on columns of differing polarity, using hydrogen flame ionization detectors. The identity of suspected residues is confirmed by additional GLC and by mass fragmentography. The lower limits of detection were: water samples, 0.0004-0.001 ppm; soils, blood, and urine, 0.001 ppm; forage grasses, forage legumes, and rice foliage, 0.005 ppm; and milk, eggs, fish, shellfish, poultry and cattle tissues, and feces, 0.010 ppm. (Author abstract by permission)

75-0984. Haeberer, A. F.; Chortyk, O. T. (Richard B. Russell Agr. Res. Cent., Athens, GA 30604). **Rapid determination of maleic hydrazide in cigarette smoke condensate and particulate matter.** *J. Agr. Food Chem. 22(6): 1135-1137; 1974.* (12 references)

Maleic hydrazide (1,2-dihydro-3,6-pyridazinedione), a systemic plant growth regulator, is used extensively as a tobacco sucker inhibitor. A rapid method has been developed to determine quantities of

maleic hydrazide (MH) in tobacco smoke condensates. The method involves microcolumn chromatography on alumina, derivatization to form the bis(trimethylsilyl) derivative, and quantitation by gas chromatography. This method has been applied to both cigarette smoke condensate and total particulate matter of cigarette smoke. Various aspects of methodology as well as MH transfer rates from cigarettes into smoke are discussed. Significantly, more than 99% of the MH content of cigarette tobacco was destroyed during smoking. (Author abstract reprinted by permission of the American Chemical Society)

75-0985. Webster, G. R. B.; Macdonald, S. R.; Sarna, L. P. (Pestic. Res. Lab., Dept. Soil Sci., Univ. Manitoba, Winnipeg, Manitoba, Canada). **Gas-liquid chromatographic determination of Sencor (metribuzin) and its major metabolites and photoproduct.** *J. Agr. Food Chem. 23(1): 74-76; 1975.* (18 references)

A new method has been developed which enables simultaneous GLC analysis of the *as*-triazinone herbicide Sencor (metribuzin) (21087-64-9) and its three major metabolites and degradation products. Best results were obtained using 3% Silar 5CP on Chromosorb W (acid washed, DMCS treated). Tritium electron capture detection was more sensitive (0.01 ng of Sencor minimum), but was not selective with respect to soil coextractives. Coulson conductivity detection was less sensitive (1 ng of Sencor minimum), but provided selective quantitation of nitrogen containing compounds; no interfering peaks were observed in soil extracts. An improved method of GLC analysis for Sencor alone using the Melpar flame photometric detector is described. Linear response over the range 3 to >150 ng of Sencor was observed. No interfering peaks were observed in soil extracts; the quantifiable minimum was 1 ng of Sencor. (Author abstract reprinted by permission of the American Chemical Society)

75-0986. Johnson, W. H.; Domanski, J. J.; Sheets, T. J.; Chang, C. S. (Dept. Biol., North Carolina State Univ., Raleigh, NC 27607). **Effects of freeze-drying on residues of TDE, DDT, and endosulfan in tobacco.** *J. Agr. Food Chem. 23(1): 117-120; 1975.* (10 references)

This study was conducted to examine the effect of freeze drying of cured tobacco shreds, with or without extraction, on removal of TDE, DDT, and endosulfan residues. Tobaccos were utilized having initially low and high levels of pesticide. Freeze drying of cured tobacco shreds significantly reduced residue levels, with up to 42% reduction for total TDE, 41% for total DDT, and 43% for total endosulfan. Because of the expansive effect of freeze drying, residue levels on a volumetric basis (micrograms/milliter) were reduced up to 74%. With the exception of the group of tobacco having low initial levels of TDE and DDT, the extraction step prior to freeze drying did not contribute significantly to pesticide reduction in comparison with standard freeze drying. Analyses of water extracts substantiated this conclusion. (Author abstract reprinted by permission of the American Chemical Society)

75-0987. Polen, P. B. (Velsicol-Chem. Corp., Chicago, IL 60611). **Industry procedures for preservation of integrity of analytical reference standards and validity of residue analysis.** *Kem.-Kemi 1(9): 615-616; 1974.* (1 reference)

Communications from the Central Residue Laboratories of eight U.S. basic pesticide manufacturers were used to determine the optimal industrial procedures for pesticide residue analyses. The reference standards may be pure compounds, mixtures, or standard solutions, their acceptability being established via a multi-technique system such as elemental analysis, thermal data, NMR, infrared, mass spectroscopy, TLC, and GLC. Most laboratories assign a code number and an assay to each lot of standard prepared and store the standards at low temperatures (0 to -20°C). In general, existing standards are only occasionally rechecked, standard solutions being the most frequently rechecked. About half the laboratories recommend criteria for sampling in the field, most considered recoveries in excess of 70% as acceptable, and most relied heavily on exhaustive extraction and recovery experiments as indicators of "bound" residues. There does not appear to be a well-defined, widely used practice for gauging the limit of residue determination.

75-0988. Cox, J.; Donegan, L.; Pinegar, J. A. (Tropical Products Inst., 56-62 Grays Inn Road, London WC1X 8LU, England). **The estimation of surface residues of benomyl on treated bananas.** *Pestic. Sci. 5(2): 135-145; 1974.* (10 references)

A simple rinsing technique for the extraction of benomyl residues present on the skin of bananas, a microbiological assay, and a UV spectrophotometric assay for its estimation are described. Use of these in a persistence study with benomyl on bananas showed good recovery by both methods. Preliminary work on plantation-treated bananas revealed that the benomyl was persisting unchanged and not decomposing to any appreciable extent during ripening and storage of the fruit. (Author abstract by permission)

75-0989. Vyboh, P.; Michalek, M.; Sustek, J.; Batora, V. (Res. Inst. Agr. Technol., 810 04 Bratislava-Predmestie, Czechoslovakia). **Gas chromatographic determination of technical pyrazon (5-amino-4-chloro-2-phenyl-3(2H)pyridazinone).** *Pestic. Sci. 5(2): 171-176; 1974.* (9 references)

5-Amino-4-chloro-2-phenyl-3(2H)pyridazinone (pyrazon) is the active ingredient of herbicide formulations known under the trade names Burex, Chlorazine,

Pyramin, Phenazon. Pyrazon content was evaluated using the internal standard 4-chloro-5-methylamino-2-phenyl-3(2H)pyradazinone. FID detector and glass column (50 X 0.25 cm) packed with 2% cyclohexane-dimethanol succinate on silanized Chromosorb G (80-100 mesh) were used. Technical products can contain two interesting impurities, the non-active pyrazon isomer 4-amino-5-chloro-2-phenyl-3(2H)pyradazinone and the unreacted 4,5-dichloro-2-phenyl-3(2H)pyradazinone, the latter of which is significant from the point of view of toxicology. Determination of these two compounds under the conditions used for pyrazon is practically impossible. They were therefore determined on a separate glass column (70 X 0.24 cm) packed with 5% cyclohexane-di-methanol succinate on Chromosorb G (60-80 mesh). A standard addition method for small concentrations of 4,5-dichloro-2-phenyl-3(2H) pyridazinone in technical pyrazon products is also described. (Author abstract by permission)

75-0990. Marshall, W. D.; Greenhalgh, R.; Batora, V. (Chem. Biol. Res. Inst., Res. Branch, Canada Dept. Agr., Ottawa, Ontario, Canada). **Determination of impurities in technical fenitrothion by liquid chromatography.** *Pestic. Sci. 5: 781-789; 1974.* (18 references)

Gas and liquid chromatographic methods were evaluated for determining the impurities in technical grade fenitrothion (⩾95%). These impurities were *S*-methyl fenitrothion, fenitrooxon, bis-fenitrothion, *S*-methyl-bis-fenitrothion and 3-methyl-4-nitrophenol. The GC proved to be insensitive to the two bis compounds whereas these compounds could be analyzed by liquid chromatography on a Corasil II column or on an OPN column. Nine technical samples were analyzed and *S*-methyl fenitrothion, a potent anticholinesterase agent, was by far the most common impurity. (Author abstract by permission)

75-0991. Lavy, T. L. (Dept. Agron., Univ. Nebraska, Lincoln, NB 68503). **Effects of soil pH and moisture on the direct radioassay of herbicides in soil.** *Weed Sci. 23(1): 49-52; 1975.* (12 references)

The addition of 1.5 ml water or 1.5 ml 0.1 *N* oxalic acid solution to 2 g soil samples containing ^{14}C-labeled herbicides increased the ^{14}C extraction efficiencies. The employment of a modified dioxane extracting-counting solution allowed the addition of 2 ml water without causing a liquid phase separation. Extraction of benzoic acid herbicides from soil was enhanced when 5 mg oxalic acid was added to 2 g soil or when soil was acidified to pH 4.1. (Author abstract by permission)

75-0992. Brenner, K. S.; Mueller, K.; Sattel, P. (Untersuchungslab. BASF AG, Ludwigshafen, Germany). **Nachweis und Bestimmung von 2,3,7,8-Tetrachlordibenzo-*p*-dioxin in chlorsubstituierten Phenoxyalkansaeuren. [Detection and determination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin in chlorine-substituted phenoxyalkanoic acids.]** *J. Chromatogr. 90(2): 382-387; 1974.* (14 references) (German)

Methods for the detection and determination of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (dioxin) in chlorine-substituted phenoxyalkanoic acids, such as 2,4,5-T, are described. A method developed by the Deutscher Arbeitskreis fuer Pflanzenschutzanalytik (DAPA-method) is based on extraction of the sample dissolved in dimethylformamide-acetonitrile-water with *n*-hexane, treatment of the hexane extract with ammonia and water, column-chromatographic clean-up on aluminum oxide, thin-layer chromatography on silica gel, and gas-chromatographic analysis of the eluted dioxin on chromosorb W AW DMCS. By another method, dioxin is determined by extractive distillation and subsequent gas chromatographic analysis on a Dexsil capillary column. Certain steps of the two different methods can be combined. The lower limit of detection is 0.01 ppm, while quantitative determination is possible from 1 ppm upwards.

75-0993. Pflugmacher, J.; Ebing, W. (Inst. Pflanzenschutzmittelforsch., Biol. Bundesanst. Land- und Forstwirtschaft, D 1 Berlin 33, Germany). **Reinigung von Phosphorsaeureinsektizidrueckstaenden in Gemueseextrakten durch Gelchromatographie an Sephadex LH-20. [Clean-up of organophosphorus insecticide residues in vegetable extracts by gel chromatography on Sephadex LH-20.]** *J. Chromatogr. 93(2): 457-463; 1974.* (9 references) (German)

A gel permeation method, using Sephadex LH-20 and including a liquid-liquid partition step, has been utilized for the separation of twenty-two organophosphorus pesticides from twelve vegetable extracts. Recoveries of the different pesticides ranged between 66-98%. Residue levels were equivalent to 0.05-0.5 ppm, based on the original vegetable. Pesticide analysis was done by gas chromatography, using a thermionic detector. The method, as described, may be used as a general clean-up technique for organophosphorus insecticide residues in vegetables. (Author abstract by permission)

75-0994. Makarova, S. V.; Khmel'nitskaya, V. N.; Eliseyeva, M. A. (All-Union Sci. Res. Inst. Chemical Plant Protection Agents, Moscow, USSR). **Fotometricheskoye opredeleniye fosforganicheskikh pestitsidov posle otdeleniya tonkosloynoy khromatografiyey. [Photometric determination of organophosphate pesticides after thin-layer chromatographic separation.]** *Zavod. Lab. 7: 792-795, 1974.* (8 references) (Russian)

A method for the separation and photometric determination of benzophosphate (phosalone), diphos, anthio (formothion), baytex (fenthion), metaphos

(methyl parathion), bromophos, rizid, carbophos (malathion), and trolene (ronnel) is described. The pesticides are dissolved in chloroform and separated on KSK silica gel previously activated at 110°C. The spots containing pesticide are visualized by means of potassium permanganate, scraped off, and eluted by means of sulfuric acid and nitric acid. The purified samples are taken up in a solvent (5:1 hexane with acetone for benzophosphate, benzene for diphos, 1:1 heptane with acetone for anthio, 15:1 hexane with acetone for metaphos, 2:1 hexane with benzene for bromophos, 5:1 benzene with acetone for rizid, 1:1 heptane with acetone for carbophos, and 2:1 hexane with benzene for trolen). The pesticides are determined by photometry at 364 nm. The recovery rate was found to be well over 95%. This method is suitable for the quality control of pesticide preparations, and for the control of their stability.

75-0995. Copin, A.; Martens, P. H.; Kettmann, R.; Closset, J. L.; Duculot, C. (Lab. Chim. Anal., Fac. Sci. Agron. Etat, 5800 Gembloux, Belgium). **Application de la spectrometrie par reflexion totale attenuee dans l'infrarouge et de la spectrometrie dans le visible a l'etude des residue d'antigerminatifs (propham et chlorpropham) sur les tubercules de pommes de terre. [Application of infrared total attenuated reflectance spectrometry to detection of herbicide (propham and chlorpropham) residues on potato tubers.]** *Anal. Chim. Acta. 74: 437-440; 1974.* (5 references)

Potatoes treated with propham and chlorpropham were analyzed for herbicide residue content without extensive cleanup by multiple total attenuated reflectance spectrometry (M-ATR). Chopped potatoes were extracted with petroleum ether by shaking for 2 hr, and the samples dried with sodium sulfate. The concentrated extract was then subjected directly to M-ATR. The spectrum was recorded at a speed of 0.48 min μm^{-1}. The presence of IPC was evidenced by its absorption band at 9.75 μm. For spectrophotometric analysis, solvent was evaporated from an aliquot of the extract, and the propham or chlorpropham subjected to alkaline hydrolysis into aniline or chloroaniline. The residue was distilled and trapped in HCl. After diazotization with sodium nitrite, the aniline was coupled with naphthylethylenediamine, and the color read at 540 nm. It was not possible to distinguish between aniline and chloroaniline with this method. The absorption bands of potato components did not interfere with these herbicide determinations, so that extensive clean-up was not necessary.

75-0996. Kvalvag, J. (Chem. Res. Lab., Agr. Univ. Norway, N-1432 As-NLH, Norway). **Fungitoxic alkyl 2-benzimidazolecarbamates and some thin-layer chromatographic detection reagents.** *J. Chromatogr. 93(2): 491-493; 1974.* (9 references)

Thin-layer chromatographic determination of benomyl and thiophanates and their degradation products was investigated, using prepared TLC sheets from two manufacturers in order to examine discrepancies previously observed in these determinations. Spots containing 0.1-3.0 μg of EBC (ethyl 2-benzimidazole carbamate), MBC (methyl 2-benzimidazole carbamate, carbendazim), and 2AB (2-aminobenzimidazole) were developed with 10% methanol in benzene. After drying the plates and observation of UV fluorescence, the following techniques were tried: spraying with a 0.5% solution of 2,6-dichloro-*p*-benzoquinone-4-chlorimine in cyclohexane and acetic acid, a 1% solution of the bromo derivative of this compound in the same solvents, or aqueous sodium hypochlorite solution (0.3% free chlorine); and exposure to chlorine and bromine vapor. The two chromogenic compounds gave a spot with 2AB similar to the blue color produced by spraying with aqueous sodium hypochlorite solution or by exposure to chlorine or bromine vapor. Thus the true chromogenic part of the benzoquinoneimine molecule is the reactive chlorine atom. For quantitative TLC analysis, exposure to a gas is preferable to the use of spray reagents, as gas distribution is more even. Previous irregularities in color development of MBC with benzoquinone chromogen were probably due to hydrolysis of the carbamates to 2AB under the influence of impurities in the chromatography sheet.

See also **75-0796** **75-0914** **75-0953**

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